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The Institute of British Foundrymen

The Institute of Vitreous Enamellers

The Welsh Engineers' and Founders' Association

and

The Foundry Trades' Equipment and Supplies Association

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Foundry Lighting

On a number of occasions we have addressed ourselves to a study of this subject, but until recently our matter has had to be based on generalities. Now, however, there have become available data which transform the subject from a platitudinous plane to a very concrete basis of an industrial necessity. Statistics are available to show that production slows up with any departure from recognised adequacy, until obviously the point arrives when it automatically ceases. It is somewhat alarming to state that 70 per cent. of the factories in this country provide less than a quarter of the light found by practical experiment to be desirable and, indeed, standardised upon by the more progressive concerns. Foundries should have, to our mind, a minimum of eight, and preferably ten, foot-candles; yet there is a case on record where one foundry increased its overall illumination from 2.5 to only 7, and immediately registered an increase in production of 7.5 per cent. Apart from the obvious fact that one can do things more quickly if vision is adequate, there are the usual inevitable repercussions of bad lighting, such as defective workmanship, or its appellation in a company's book —"scrap castings." A second one is that ill-lit corners of foundries become the natural repository of junk, and we have personally been impressed with the enhanced tidiness to be noted in a well-illuminated foundry. Junk has its dangerous aspect as a prolific cause of the outbreak of fire, as well as a wide assortment of industrial accidents. A final repercussion is the dispersion of the "doldrums" which inadequate lighting induces.

Another aspect of lighting which has received the attention of the experts is the incidence of glare, which is probably worse in its effect than general inadequacy. The piece of paper attached to the edge of a lamp shade to protect the eyes from glare and yet illuminate the work is so obviously an improvisation that can easily be made into a workmanlike job.

Just as oiling is an essential operation for the proper performance of machinery, so, too, is the use of soap and water for the adequate functioning of a lighting system. As part of its standard equipment every foundry should possess its own light meter, and through its routine use it becomes a simple matter to learn precisely what periods can elapse between thorough application of soap and water to the fittings. It is authoritatively stated that, in a foundry, the loss may amount to as much as 30 per cent. Stated in terms of money, this means that 30 per cent. of the lighting bill is wasted through negligence to effect what can be classed as the simplest form of plant maintenance. The human eye is quite unfitted for noting the gradual deterioration in illumination, and recourse must be had to proper scientific instruments. For foundry purposes the mercury discharge lamp has been found to be particularly satisfactory, as it gives good definition for the black surfaces of sand moulds. Ways and means are now available for minimising the disagreeable colour of the light emitted by the discharge lamps.

The provision of adequate lighting now extends far beyond the pious hope of individuals like ourselves, for it has become the law of the land, and the Factories Act of 1937 requires that "effective provision shall be made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of a factory where people are working." There is now little excuse for the executives of a foundry to be in doubt as to whether their lighting system is satisfactory, for the E.L.M.A. Lighting Service Bureau—an organisation sponsored by practically all the well-known electric lamp manufacturers—will on request send an expert with a light meter to test out the system and to make recommendations for its modernisation. Having no sales department, such an investigation can be regarded as disinterested in a particular sense. In the general sense, it might not have the whole-hearted support of the gas industry! We know of some foundries which have splendid general illumination by means of a high-pressure gas system, but for local lighting, they revert to electricity.

The modern light meter demands a certain amount of intelligence for the proper appreciation of the readings shown. For example, if a man operating a moulding machine invariably works in his own shadow, then the reading should be taken under these conditions, and calculations as to adequacy must necessarily take this into account. Probably remedial measures will have to be taken. It is especially important that a new machine which may have cost a large amount of money should be examined from the aspect of proper illumination, as some of the value of capital expenditure may easily be lost. Moreover, experienced operatives on new machinery, like any neophyte in a factory, are more prone to accidents than when they are properly settled on a job, and lighting is an important contributory factor in both cases.

Finally, not all foundries are adequately illuminated naturally, and in many, whilst it is satisfactory for nine-tenths of the shop, the residual tenth requires artificial lighting, even on the brightest of summer days. Only a light meter can determine such points, and furnish information for future action.

Non-Destructive Testing

A JOINT DISCUSSION

The Joint Committee on Materials and Their Testing is organising a meeting, which will be held under the auspices of the Institution of Electrical Engineers on November 25 next, to discuss the methods of non-destructive testing. The subjects to be discussed include: Magnetic and electrical methods; X- and Gamma-rays; acoustical and general methods. Authors representing Great Britain, the Continent of Europe, and the United States will present the following Papers:—

Magnetic and Electrical Methods:

Dr. A. P. M. Fleming, C.B.E., and Mr. B. G. Churcher—"Non-destructive Testing on Materials by Electrical and Magnetic Methods."

Dr. R. Berthold (Germany)—"Non-destructive Testing based on Magnetic and Electrical Principles."

X- and Gamma-Rays:

Dr. V. E. Pullin, C.B.E.—"Radiography—an Aspect of Non-destructive Testing."

Ir. J. E. de Graaf (Holland)—"Industrial Radiography on the Continent of Europe."

Acoustical and General Methods:

Dr. S. F. Dorey—"Acoustical and General Methods of Non-destructive Testing."

Prof. Dr. Köster (Germany)—"Modulus of Elasticity and Damping in relation to the Study of Material."

The experience and views of the United States of America will be presented in a joint Paper prepared by a Committee of the American Society for Testing Materials, composed of Mr. N. L. Mochel (metallurgical engineer, Westinghouse Electric and Manufacturing Company, Philadelphia); Mr. H. H. Lester (senior physicist, Watertown Arsenal, Waterton, Mass.); and Mr. R. L. Sanford (chief of the Magnetic Section, National Bureau of Standards, Washington, D.C.).

In view of the authoritative nature of the Papers and of the topical interest of the subject, it is expected that the meeting will be of considerable importance. The meeting will be held at the Institution of Electrical Engineers under the Presidency of Dr. A. P. M. Fleming, President of that Institution, on November 25, from 10 a.m. to 1 p.m., and 2 to 5 p.m. A general invitation to attend is extended to all those who are interested. Applications for advance copies of the Papers should be addressed to the Secretary, The Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2.

International Pig-Iron Situation

Paris

Figures for the French production of pig-iron for August show a further decline and 421,000 metric tons were produced against 433,000 in July and 462,000 tons in June. The monthly average for the first eight months is thus only 504,000 tons, against 660,000 metric tons last year. Only 76 blast furnaces are in operation against 106 last year. The threatening international situation at the end of September had one good effect on the industry, inasmuch as it permitted a certain part of the stocks on hand to be sold. Nearly all producers have been able to reduce their stocks, which had been growing dangerously large.

Brussels

The international crisis has also had a certain beneficial effect on trade in Belgium. During the whole of the danger period, Belgian plants were inundated with orders from abroad by firms who feared that war might lead to the interruption of communications and so interfere with supplies. Belgian plants, it must be admitted, took advantage of what they considered to be the last chance, as the outbreak of war would probably have lead to the closing down of all enterprises doing an export business, in order to maintain a strict neutrality. Luxemburg was preparing to take the same course. The peaceful settlement of the dispute, however, has given Belgian firms a new hope. The period of international peace which is now expected will, it is felt, encourage consumption and improve demand.

Berlin

One of the shadows which, from the German point of view, overhung the situation was the almost complete absence of any stocks of pig-iron. Pig, as rapidly as it can be produced, is absorbed by the steelworks and foundries. The cession of the important mines in Bohemia to the Germans will, perhaps, help to remedy this penury, but it will take time before this additional source of iron will be able to be put to use. Steelworks during the month of September worked at 94.5 per cent. of their capacity. Taking into consideration machinery not in use on account of repairs, this figure is considered as being the limit to which the industry is able to work.

Book Review

A B C of A.R.P. Published by Jordan & Sons, Limited, 116, Chancery Lane, London, W.C.2. Price 6d.

By means of diagrams, plans and pictures this book shows clearly what precautions members of the public can take to protect themselves against attack from the air by high explosive, incendiary bombs, and gas. The instructions, together with the pictures, make it possible for men and women to obtain quick and inexpensive protection. In addition there are included information and pictures of vital interest to A.R.P. personnel. As much of the text matter is presented in tabular form, it should be of assistance to those in training. Wardens will also find the diagrams of particular interest when imparting information to the public.

The contents include instructions, together with easily understood diagrams and pictures for constructing three different types of garden trench shelter; how to take precaution against high-explosive and incendiary bombs; how to make a room gas-proof; how to use a gas mask; how to recognise air-raid warning signals; how to detect and identify the various gases; how to render first-aid to gas casualties and subsequent treatment of gas casualties; how to put on and take off protective clothing; the routine of a decontamination station and other useful information.

The illustrations are a feature of the book; for example, the picture of a cleansing station in operation shows at a glance what would otherwise take pages to describe. Such has been the aim throughout the book.

U.S. Steel Industry's Repair Bill

The United States steel industry spent more than $260,000,000 on upkeep of plants and other properties in 1937 (nearly 15 per cent. above 1936) reports the American Iron and Steel Institute. About $228,000,000 was spent for repairs and maintenance in 1936, equivalent to approximately $7 per ton of finished steel produced by the companies from whom data were received. For 1937, repairs and maintenance charges represented nearly $8 per ton produced, and totalled 9 per cent. of gross sales income. In addition, the steel industry charged off about $142,000,000 for depreciation and depletion of its equipment and properties. Expenditures for new equipment and construction during the year reached a total of $320,000,000.

The Rally in Metals

By "Onlooker."

The trade recession, both in the United States and in this country, was most marked during the first half of the year, or at any rate, its effect upon the course of metal prices was certainly most noticeable during the early months. With stocks on the increase and buying by consumers the reverse of satisfactory, it is not surprising that quotations declined in a marked manner, until in May it began to look as if the bottom would fall out entirely. At the eleventh hour, as usually happens, a sudden change occurred in sentiment, and without the development of any special bullish tendency, all the markets took a turn for the better, with rallies all along the line.

At this time spelter had declined to £12 and lead to £13 10s., while tin was no better than £158; standard copper stood at £32 10s. and wire bars at £37 10s. This was a sorry state of affairs from the producers' point of view, and not of much use to consumers, for confidence had been sapped to such an extent that demand, in spite of the attractive price levels, was exceedingly poor. As always, however, the point was reached when the cheapness of a commodity proves to be an irresistible attraction to buyers, and sellers in the face of this took alarm and began to lift their limits.

American Depression and European Crisis

This check to the downward trend, for, in fact, it was apparently nothing else than that in the initial stages, did not put much heart into the bulls, but it gave the bears pause and forced them to consider whether selling short was any longer worth while. Let us remember that up to this time the fashion had been to table everything to a lower level and market operators were acting accordingly; nor was the change round to different tactics effected overnight. Confidence is not born in a day, and people had become so gloomy about prospects in the States that it was difficult to believe in any upward trend in the face of such discouraging prospects; moreover, at this time the outlook in Europe began to assume a somewhat threatening aspect. In spite of this, or perhaps because of it, for with the likelihood of an intensification in rearmament it was obvious that the demand for non-ferrous metals would increase, the upward movement developed, gradually it is true, but the trend was unmistakable. Encouragement to those who believed that a change had occurred was also given by the fact that in most directions output control was either in being or else in prospect, although in the case of spelter the likelihood of a cartel coming into existence was not thought to be very bright.

When, however, in September, it appeared as if war were imminent, and preparations went forward with feverish haste in this and other countries, there was no spectacular rise in metals as might have been expected. Mercifully the world was spared the horror of war waged with modern weapons, and actually the sequel has proved that a fair amount of business had been held up by the crisis and that the speculator thought sufficiently well of the improved outlook to buy freely for the rise. The passing of the threat to peace and the hope that war may be outlawed has created an atmosphere of optimism which has resulted in substantial advances in the prices of the non-ferrous metals. In the van of the advance is undoubtedly copper, and the recovery to a point beyond 11 cents, although it may prove to be a doubtful blessing as encouragement is given to additional production, is not at all surprising in view of the excellent statistical position of the metal. Output has been increased by 10 per cent., but it is a moot point whether the producers may not have delayed their action rather too long.

Institute of British Foundrymen

ALTERATION OF BYE-LAWS

The annual general meeting of the Institute of British Foundrymen, which was adjourned from June 14, 1938, was resumed at the Engineers' Club, Albert Square, Manchester, last Saturday, Mr. C. W. Bigg presiding.

Consideration was given to the following items on the agenda of the meeting of June 14, namely:—

To propose:—

(12) "That the Bye-Laws so altered and added to and as contained in the print laid before the Meeting be and the same are hereby adopted as the Bye-Laws of the Institute in lieu of the present Bye-Laws such present Bye-Laws to cease to have effect and the Bye-Laws so adopted to come into force and effect when and so soon as the approval of the Privy Council to the Bye-Laws so adopted and the certificate of approval under the hand of the Clerk of the Privy Council have been obtained."

(13) In the event of the Bye-Laws being adopted it will be proposed:—

"That the Council be and it is hereby authorised to take all necessary steps to obtain the approval of the Privy Council to the newly adopted Bye-Laws and for such purpose if necessary to seek the granting to the Institute of a Supplementary Charter."

(14) Any other business.

The PRESIDENT explained that the meeting had been adjourned from June 14 in order to continue a discussion on a resolution which was proposed by Mr. S. H. Russell, and seconded, he believed, by Mr. Winterton. At that meeting there was some discussion as to the legality, first of all, of an adjournment. In order to make the position quite clear he was going to ask Mr. Makemson to read the legal opinion upon the point.

MR. MAKEMSON (Secretary of the Institute) stated that the solicitors who had been giving advice with regard to the bye-laws had stated it was perfectly clear that a body, constituted as was the Institute, had the power to adjourn a meeting to a convenient date, and a resolution passed at such an adjourned meeting would be just as valid as if passed on the first date of the meeting. Indeed, the two meetings together were the annual general meeting.

The CHAIRMAN then called upon Mr. S. H. Russell to open the discussion by recounting the procedure to date.

MR. RUSSELL thought it would not serve any useful purpose if he spent some considerable time going over the history of the changes in the bye-laws. At Bradford there were two outstanding things in the discussion which arose. First, some members made a point quite clear. They were particularly members who were not definitely or conveniently attached to any Branch. As they all knew, many members could not conveniently attend Branch meetings. It was found that such members were, to a great extent, unfamiliar with the proposals which were before the annual meeting. For that reason, the Organisation Committee decided to circularise the memorandum to all classes of members, which was received about a month ago. It was a four-page leaflet, and really contained everything as regarded the history and the reasons for the suggested alterations to the bye-laws.

A second objection, and perhaps a more important objection, which was raised at Bradford was to the increase in subscriptions. That point, of course, would be further discussed that afternoon. Nothing in the previous discussion at Bradford could be said to have altered the unanimous recommendation of the Organisation Committee that the bye-laws should be adopted, supposing the subscriptions were increased. He did not think it would serve any useful purpose if he elaborated the point for the moment, as to the particular reason why they should be increased. The matter had been gone over before. The Organisation Committee were fully convinced it was necessary for the well-being of the Institute that the subscription income should be increased.

The CHAIRMAN then announced that the Secretary had received a number of letters with reference to the resolution to increase subscriptions. He asked him to read them.

MR. T. MAKEMSON accordingly read the letters protesting against an increased subscription, and also a number of letters in support of the proposal.

The CHAIRMAN said he had no desire to restrict in any way the opportunity of any member to express his views on the matter under discussion. He was anxious that there should be a thorough expression of opinion, and he was sure that all present would appreciate the desirability of every speaker keeping to the point and coming to a finish as quickly as was reasonably possible.

The Position in Scotland

MR. DANIEL SHARPE (Scottish Branch) regretted that Mr. Ballantine was unable to be present, as he officially represented the Scottish Branch. He hoped that the attitude of the Scottish Branch would not be misunderstood. He thought that Mr. Cooke, in his letter, had clearly set out the position of the Scottish Branch, although he had tried to state the negative case. It would appear almost as though the Scottish Branch had a peculiar membership in so far as they had a very large number of operatives. When compared with, say, the London Branch, who had a minimum of workshop members, it was well that they should appreciate the point of view expressed by the Scottish Council. He would like to assure them all that at the last meeting of the Scottish Branch appreciation was expressed for the work done by the Committee, and the Scottish Branch were very sincere in believing that that Committee were acting for the very best interests in their own view, and according to the information they had before them. In the Scottish Branch they had a large number of members who were operatives and also members in junior executive positions. The view which had been expressed at Bradford on their behalf was much the same as the view which was held that day, namely, it was feared that by increasing the subscription the original intentions of the association would be hampered.

MR. R. A. MILES (Manchester): In what way will it do that?

MR. SHARPE replied that in Scotland they believed in giving good value for money as well as expecting value for money. They did not want to give less than what a man was paying for. From the point of view of the man on the floor he thought that they ought to be careful and see that they were not going to put the man in the position of saying: "Well, it is not worth while," and dropping out. He just raised the point that they should be quite conscious there was no desire on the part of the Scottish Branch to belittle the work of the Committee who had been to a great deal of trouble and had done their work so well. Nevertheless, they ought to keep in view the original intention of the association to bring the operatives into touch with them all. Perhaps they were unfortunate in Scotland from the point of view of having such a number of their active members in men who were working on the floor. He did not wish to enlarge on the situation from the point of view of the increase of subscription. His personal point of view, and he thought also that of his colleagues who were present upon that occasion, was that the increase mattered very little. They did want to know whether the man on the floor was going to get value for his money. It was quite appreciated that the medium-class man was not going to suffer very badly, while the actual junior was going to be better off to the extent of sixpence. It was not a case of bargaining as to whether they were going to pay a pound more or a pound less. It was necessary to consider whether they were likely to sacrifice a type of member whom it was desirable to have in the Association.

Pessimism at Newcastle

MR. LASHLY (Newcastle Branch) felt that Newcastle must associate themselves with the Scottish Branch. Mr. Gresty, who was their President last year, had already expressed himself on the point, he thought. The membership of the Newcastle Branch was made up of about 65 per cent. of men who were operatives. There was not the slightest doubt that when the new terms of the subscription were mentioned to them those men would leave. Newcastle felt very strongly that it would mean the breaking up of the Newcastle Branch.

London's Approval

MR. C. C. BOOTH (London Branch) could not understand what the Scottish people really had to complain of. He thought they all appreciated that they opposed the proposition, and this was to some extent an advantage, because it had enabled all the members to obtain a fuller grasp of what the Organisation Committee were doing. He could not understand why anyone should think they were trying to exclude the operatives; as a matter of fact, they were trying to do more for them. Their subscription was not more; he believed it was less. In some cases they could get in for 5s. If the Institute became a more powerful body surely they could do more for their members. At the present time he did not think the Branches did a great deal for them. A certain number of lectures was provided for, though they were not all published.

In London they were not able to get all the operatives to attend meetings, because they covered such a large area. The meetings had to be held in a central place in the West End, which involved the men having to travel long distances, as the foundries were very widely scattered. They were unanimous in their support of the proposition at the meeting in London.

MR. T. MAKEMSON then read the details respecting the proportion of the different grades of membership in each Branch of the Institute.

Fifteen Per Cent. Operatives

MR. V. DELPORT (London Branch) said that it seemed apparent the objections to the scheme had been made on behalf of a particular class of membership, namely, the operative or the man who worked by manual labour. It was apparent also that that class of membership constituted about 15 per cent. of the total membership of the Institute. He was, of course, open to correction on that point; but he thought it was also the fact that 15 per cent. or the large majority of such operatives were associates.

He could not help referring to a statement made at the previous meeting, on behalf of some of these men, to the effect that they were not interested in an increase of status of the Institute, and they did not want it. Speaking from the floor himself, and not as a member of the Committee, this seemed to be an indefensible attitude. In his opinion, any man who belonged to an organisation, whether it be an Institute, a business, a club, or a Church,

who was not interested in the development, the prestige and the increase of influence of such organisation was not much use to his organisation, nor was he much use to the other members of his organisation. The best thing to do with that type of argument was to dismiss it from consideration. He would now come to what he termed the solid objections. They seem to come under two headings; namely, (1) increase of subscription, and (2) qualification. It should be remembered that they were dealing, in fact, with a number of men the majority of whom at the present moment either were or would be eventually Associates of the Institute. As regarded the new rules, they were going to be asked to pay a subscription of 10s. as against the 10s. 6d. they were paying at the present time. Therefore, far from there being an increase in their subscription, there would be a slight decrease.

Qualifications

A new provision was being made in the rules for young men under 21 years of age only to pay 5s. Therefore, there was no financial hardship in the new rules as they applied to the particular class of men on whose behalf the objection had been made.

Were they getting less for their subscriptions? No! They were going to get exactly the same advantages they were receiving at the present time. In addition, if the scheme went through it would put the Institute into such a position that in future it would be able to do more for their particular class as well as for the other members of the Institute.

With regard to qualification, at the present time any operative could join the Institute without qualification, if they were of the age of 21. In his opinion, the objections put forward on behalf of the men referred to fell to the ground, and he could not see any reason why Resolution No. 12 should not be passed unanimously.

Improved Finances

Mr. J. Gardom (Birmingham Branch) spoke in favour of the resolution being passed. He thought the objections of the operative had been suitably dealt with by previous speakers. He considered that, if the resolutions were passed, in a few years the Institute would be £1,000 per year better off. Assuming that the increase of revenue was only £500 it would enable them to do a great deal more for the operative. He had almost made himself unwelcome on the Technical Committee by forcing men who were doing a job every day to do some work at home at nights for the benefit of the operative. He would not recapitulate all the work done in that respect, but they had published three major items of interest to the operative. First, there were photomicrographs of cast iron; (2) a further series for malleable iron; and (3) information with respect to the properties of grey cast iron. With regard to the first two publications they had to go to someone else for assistance, while in the third case they hoped there would be some financial return. Could anyone say that those three publications were of no advantage to the operative? He thought not. It was the province of the Institute to bring the operatives into their organisation and to improve the standing of those men. It was only fair to assume that more could be done for their benefit if there was more money applied to that purpose.

West Riding Approval

Mr. A. S. Worcester (West Riding of Yorks Branch) thought there was one point which must not be lost sight of. Many Associate members were actually operatives or worked in the capacity of minor foremen. They had become Associate members chiefly in order to get the Proceedings, and he thought they were the largest number of members to be affected by the proposed alterations. Actually they were better off under the new bye-laws. According to the circular which was sent out, under the new bye-laws they could be Associates and purchase the Proceedings for 7s. 6d. In the West Riding Branch, he claimed that they had perhaps more members in actual contact with moulding or on the floor or as minor foremen than any other Branch in England. In his Branch, the proposed alterations of bye-laws were certainly not viewed with alarm.

Mr. F. A. Harper (Lancashire Branch) said that Mr. Worcester rather seemed to infer that an Associate member, wanting to economise, would immediately spend 7s. 6d. instead of 30s. There were something like 1,000 Associate members.

A Question of Grading

Mr. J. Cameron, junr. (Scottish Branch), speaking from the point of view of the Scottish Council, said they had very few Associates. He thought six was the total number. Their operatives were Associate members. It was a much greater thing for a practical man on the floor to pay his extra 10s. 6d. than it would be for people such as himself. Such a man would probably have to revert to being an Associate as opposed to continuing as an Associate member. Should they not include provision to enable the man on the floor, who was an Associate member, to be an Associate and still derive the benefits of the Institute by attending meetings and taking part in discussions. He could buy the Proceedings if he desired. It was a point upon which he would like to be quite clear—the transference from Associate membership to Associateship.

Mr. Makemson said it was implied that any member of the Institute could transfer to any other grade if he was qualified for that grade. In other words, a man who was an Associate member at present, but who fulfilled the qualification for Associateship as detailed in the rules, could transfer to Associateship.

Mr. J. Cameron, jun., read the following paragraph:—

> "An operative engaged in the founding industry shall be entitled to remain in membership as an Associate irrespective of age. No other person, unless elected an Associate prior to June 1, 1938, can retain membership as an Associate after attaining the age of 28 years."

He submitted there was a definite number of minor foremen who could not be classed as operatives and on whom Associate membership was a burden.

Mr. Makemson said it would not apply to minor foremen.

A Student Member said there was a small number of students in the Institute, and they were always hearing foundrymen deploring the fact that there were very few young people who took an interest in foundry work. Very few young men actually wanted to go into the foundry, whereas they would go into other trades. If the status of the Institute were raised, there would probably be many more students joining, and working their way up to responsible positions in the foundry world.

Falkirk Section

Mr. Shanks (Scottish Branch) said that a considerable number of members in the Falkirk district felt that the difficulty could be overcome by forming another grade of membership, who wished for some technical qualification. This had evidently been done before in the Institute, and the subscription had been raised from 10s. 6d. to a guinea. The Falkirk Section felt very strongly about the point, and he believed there would be a big change in that district, unless something of the sort was done. Another point was that all Associate members were proud of being members of the Institute, and hoped to continue to be members. The new bye-laws were not generally acceptable by the Associate members. He felt that the meeting should give opportunity to those members who were unable to attend to voice their opinions.

Increased Graduation Suggested

Mr. J. J. McClelland (Wales and Monmouth Branch) was of opinion that the Associate member was not the most difficult member from whom to collect subscriptions. He did not think the Institute would be so much penalised from that side as they would be from the full membership. As a matter of fact, he was recently told by a full member that he did not get very much for his money. The meeting knew his opinion about the matter. He still held the view that if the move was made by a graduated method it would be much more successful. There would be much less dissatisfaction, and he did not see any reason as yet for altering his opinion. If the meeting was not going to accept his suggestion, it left him no alternative but to vote against the resolution.

A Representative Meeting

Mr. Ben Hird (Wales and Monmouth Branch) remarked that the present meeting was called because it was felt that there was not sufficient time to discuss the subject at Bradford, and that there should be a chance afforded for the operative member to give his opinion. It would have been thought that the operative member would have made an effort to attend from some of the Branches. Even if it cost something to do so one would have thought the Branches could have subscribed to send one representative. Looking round the room it was evident that the operative member was lacking in attendance. The members who had to carry on the work, and were carrying on the work, were present again settling the point. The trouble, as he saw it, with the operative member was that that member felt if the rules became law he would lose a certain status. Personally, the speaker thought that was the position which the operative member envisaged for himself. Really, the operative member was going to be better off, and, personally, after being very much against the proposal, he had been converted in its favour. He thought it was going to be the best thing for the operative in the future.

Mr. J. Bayne (Scottish Branch) felt that while there had been a strong plea made for Associate members, two guineas was as much as many good men could afford to pay. To increase the subscription to £3 per year meant that many men could not really afford to pay it.

Lancashire's Approval

Mr. J. E. Cooke (Lancashire Branch) said the Lancashire Branch Council took the attitude some months ago of definitely agreeing with the majority of the proposals suggested. They recently thought it desirable to reconsider the position in the light of what subsequently happened at Bradford. They had again affirmed their decision to support the proposals of the Development Committee. In addition to that, at the October meeting of the Branch, a point was raised that the Lancashire Branch members should make it convenient to attend the present meeting in large numbers. Those of them who were familiar with the faces which were usually to be seen at the Lancashire Branch meetings would realise that the remark of Mr. Ben Hird was quite correct; that the people who carried out the business of the Institute were present but the grades of members it was desired should attend were absent.

Branch Secretaries, as Mr. McClelland had said, knew fairly well what the members' viewpoint was. He was rather surprised to learn from the Scottish and Newcastle Branches that their members were definitely opposed to the alteration. Personally, he felt he was as much in touch as anyone else with large bodies of men in the industry, and he had heard no serious objections put forward to the proposals from any considerable body of opinion. There were, naturally, persons who possibly would be adversely affected and wish nothing to come of

it. The general opinion of the Lancashire Branch was in support of the proposals, and he thought all its representatives would vote in their favour.

Previous Increases

Mr. Winterton (Past-President) thought they were not all looking at the matter from the same point of view. He had been a member of the Institute since 1906, and there had been several increases of subscription. He had also seen considerable advances in the status of the Institute. Upon each occasion, when increases of subscriptions were proposed, the same objections were raised. It was stated upon each occasion that they would lose their membership. They had heard to-day that at the first rise from 7s. 6d. to 10s. 6d. it was stated they would lose members, and instead they had increased their membership and were able to give a little more to the members of all grades than ever before. Upon the occasion of the second increase, similar objections were raised, but the finances improved and the membership increased. Now they were dealing with another suggested increase and the same objections were again brought before them. Candidly, he was bound to say that he did not think there would be any decrease in membership or subscriptions. He believed that the Institute would gain in status, membership and finance. It would most definitely be raised in the estimation of all other Institutions of the same character, which were operating throughout the country.

He would like to say in connection with the Scottish Branch, of which he had had the honour of being President on one occasion, that they all appreciated the enormous amount of work which had been put into the preparation of the proposals by the Committee of the Institute. He attended a meeting on the previous Saturday afternoon in Glasgow, and his hearers, if they had also been present, would have been astonished to observe the enthusiasm with which the younger operatives attended that meeting. The best feature of the afternoon was a Paper read by one of the younger members of the Institute who had been awarded a Gold Medal for its excellence. He was a thoroughly practical young man, who understood everything he was speaking about. He thought some of his Scottish friends were fearing something which was not going to happen. He believed that the finances of the Institute would increase and that its status would be most definitely enhanced.

The circumstances in respect to the Newcastle Branch were somewhat different as they had had a particularly bad time lately. They were in process of re-building their organisation, and in their particular case it might be more difficult to prevent some of the corner stones of their structure from becoming dislodged. Nevertheless, he felt that the Newcastle Branch would do their best to help the Institute and to help the Organisation Committee which had been working so hard upon the subject. He was convinced that eventually not only in Newcastle, not only in Scotland, but throughout the British Empire, membership of the Institute of British Foundrymen would become synonymous with excellence in every respect in the foundry trade.

East Midlands Approval

Mr. R. Spriggs (East Midlands Branch) said that as an indication of the feelings of the East Midlands Branch members, he came with a very strong contingent of over 20. The East Midlands Branch did not share the fears and forebodings of their northern friends. He thought the matter had now been discussed quite sufficiently and the resolution should be put.

Mr. Dunleavy (East Midlands Branch) said that a point had been made concerning the increased subscriptions being a hardship. An increase of 10s. 6d. represented slightly over an outlay of 1d. per day. He could not conceive that there was any hardship in that.

Mr. C. Lashly (Newcastle Branch) thanked Mr. Winterton for the very kind things he had said, and would like the members generally to appreciate that 8 per cent. unemployed in a district was apt to make members think somewhat on the lines of the Newcastle Branch.

Mr. J. Roxburgh (Sheffield) said that Sheffield Branch Council unanimously supported the new bye-laws.

Mr. Blythe (Birmingham) said that the members of the Birmingham Branch were not anxious to pay more money than they had done previously; nevertheless, if the subscriptions were raised, he was quite sure the Birmingham Branch would not by any means let down the Institute on that account. He did not think the membership would be substantially altered.

The Chairman thought that, as President of the Institute during the time that the matter was brought to a head, and as chairman of the meeting, he need have no qualms with regard to the possibility of any accusation that the discussion had been in any way stifled. He had not the slightest hesitation in putting the resolution to the meeting.

Upon resolution No. 12 being put to the meeting, there were 58 in favour and 5 against. It was therefore carried by a majority of 53.

Mr. Daniel Sharpe wished to assure the meeting that the Scottish Branch would be very happy to work in full collaboration with the findings of the meeting.

Resplution No. 13 was then put to the meeting on the motion of Mr. R. A. Miles, seconded by Mr. C. H. Kain. It was carried unanimously.

Mr. Makemson said there was a small point to be settled. On page 3, paragraph 4, of the suggested new bye-laws, there appeared:—"No other person unless elected an Associate prior to July 1, 1938, can retain membership as an Associate after attaining the age of 28 years." July 1 was inserted because it was thought that the proposed new rules were going to be passed at the Annual General Meeting in June, and that date would have to be altered.

Mr. S. H. Russell moved that the date be July 1, 1939, as it was necessary that the bye-laws should be presented to the Privy Council, who would require that a specific date should be inserted.

The motion was seconded and carried unanimously.

There being no other business, the proceedings concluded.

(*Concluded from next column.*)

provide the best possibility for the development of safety-minded workmen. Safety instruction should be made an integral part of all instructions relative to shop practice. Both the foreman and the instructor for class-room work should develop the habit in the apprentice of analysing all operations from the standpoint of safety, as well as from the standpoint of efficiency, accuracy and other attributes of good workmanship. Continual emphasis is essential on the facts that no one can elect to be exempt from the rules and that rules cannot be suspended at will for the sake of production, and that the chief reason for this is the welfare of the individual. A review of accidents to men in a line of work similar to that done by the individual or group that is being instructed in safety, goes far to dissipate the idea that anyone is exempt from the need of applying the safe working rules.

The author goes on to discuss periodic meetings of supervisory personnel, and urges the need for proper discipline in the conduct of an effective safety programme.

Safety in Iron and Steel Works

MAINTENANCE ORGANISATION

In the course of a Paper entitled "Maintenance and Its Relation to Safety in the Metals Industry," Mr. C. J. Smith, superintendent of maintenance at the Gary Works of the Carnegie-Illinois Steel Corporation, points out in "Iron and Steel Engineer," that the safety programme of a steel mill maintenance department naturally consists of two major divisions, namely, the promotion of the safety of the maintenance crews in the performance of their work, and the safety of operating and production crews, insofar as proper maintenance of equipment and development of improvements, based on observation of operating difficulties, can contribute to the safety of such crews. Due to the nature of the work of the maintenance man, he is called upon to work on all types of equipment and is subjected to a greater variety of risks than the average employee, a fact which should be borne in mind in the selection of personnel.

With crews properly selected for their work, the next consideration is that of proper tools kept in good condition, and special clothing or equipment where required for safety. This, of course, includes goggles, foot guards or safety shoes, leggings, gloves, aprons and helmets for burners and welders, safety helmets for men exposed to falling material, respirators for dusty locations, and oxygen apparatus where noxious fumes or gases may be encountered. Plants operating blast furnaces and utilising their by-product gases, which are high in carbon-monoxide content, must pay particular attention to the safety of operating and maintenance personnel, in all locations where this gas may be encountered.

Gas detectors are available which are arranged to show gas concentration on the dial of a suitable meter, calibrated to read directly in per cent. of carbon monoxide. Such devices should be used whenever workmen need to enter any confined space where gas may be encountered, as in gas mains, blast-furnace stoves, gas washers, engine-room basements, etc. The gas detector is recommended for areas which are normally reasonably free from gas, but which may be subject to gas due to unexpected causes. Hose masks may be employed where there is an unquestionably-pure air supply within reach of a reasonable length of hose, and a hand-operated blower used to force a supply of pure air to the wearer of the mask. When the oxygen content of the air is at all questionable, a complete oxygen-breathing apparatus must be used.

On machinery all sources of power and control must be safeguarded by the use of safety locks. Facilities should be provided so that locks are attached directly to the locking-out device and capable of removal individually. Working platforms, where required, must be constructed in accordance with accepted standards, with railings and approaches and other features required by the job, and makeshift or substandard construction must not be tolerated. The need for railings and warning signs should be carefully considered, as well as the need for special watchers.

Good light is essential to the safety of maintenance work, and sufficient temporary lights should be used to ensure adequate illumination, provided that the light intensity provided for normal operation is insufficient for repair work. Portable cooling fans may often increase the comfort and efficiency of the workmen and minimise the risks inherent in fatigue and discomfort.

The younger employees, particularly boys starting on their first job in an industrial plant.

(*Concluded in previous column.*)

Composite Construction in Heavy Welded Assemblies*

By W. E. HOLLINGSHEAD

When considering the individual parts which must be incorporated to complete a structure, the designer is faced with the task of selecting from structural shapes, plates, forgings, stampings and castings. In the construction of heavy and complicated machinery, this selection is especially important. Often when it has been decided to weld-fabricate instead of cast, the possibility of combining structural shapes and castings is overlooked. While there is no set rule where this combination is advisable, it may be said that composite construction is advantageous where expensive forming equipment and pressing or forming operations would be required if rolled steel alone were used, or where there are surface irregularities or contours which would, if fabricated, be unnecessarily expensive. One of the more frequent uses of castings in composite construction is in bearing housings of massive shape or heavy section.

Properties Compared

The designer and manufacturer need have no hesitancy in using composite construction, considering that available steel castings have physical and chemical properties which closely approximate the properties of rolled plate. It is, however, true that a casting with a chemical composition similar to a rolled plate will have lower physical properties than the plate.

In the examples of composite construction which are to follow, the steel castings are A.S.T.M. specification A-27-36, grade "B1," as modified with 0.25 per cent. carbon maximum. The plates used are low carbon welding quality steel similar to A.S.T.M. specifications, with tensile strengths from 20 to 29 tons per sq. in., and yield points from 10.7 to 14.7 tons per sq. in.

It is an established fact that the grain structure of both cast and plate steel near the welding zone is changed by the welding process. It is also well known that proper heat-treatment will correct the metallurgical structure and also relieve the stresses caused by welding to a degree which is acceptable by the industry. This final heat-treatment, in most cases, amounts to stress-relieving at from 620 to 650 deg. C.

Preparation of Joints

The preparation of the joints for welding is very much the same for both castings and plates. In larger sections machine chamfers of the "U" or "J" types are usually advisable to facilitate assembling and to reduce weld areas. With castings, the chamfers may be also gas cut, chipped, or cast. If the chamfers are cast, or if a fillet weld is sufficient, it is considered good practice to grind the casting to bright metal where the weld is to be made.

Composite Construction and Cost Reduction

A good example of the use of heavy steel castings in a welded assembly is shown in Fig. 1. This is a unit of the Smith-Kaplan adjustable blade turbines now under construction at the S. Morgan Smith plant for the T.V.A. The overall dimensions of this unit in the rough are 28 ft. outside dia. by 21 ft. 9½ in. inside dia., with an overall height of 9 ft. 5 in. The outermost part of this section, where the 20 lower bearings for the wicket gate are located, is of cast steel welded in place. The entire ring is built in four sections which are bolted together. The weight of the castings required for the complete ring is 27 tons, as compared with a total rough weight of 64 tons for the complete throat ring. The function of this unit of a turbine is not essentially a main strength member, but rigidity and absence of vibration are very important factors. From a hydraulic point of view, the inside contours are of utmost importance. It is apparent that had a casting not been used in the assembly as shown, it would have been necessary to have substituted four or five segments of plate of 2½ in. thickness per quarter section, which would be formed to the double curvature shown. The cost of the pressing dies and the forming, together with the gas-cut trimming and fitting, and subsequent welding of the segmental joints, would be excessive. In addition, there would be the problem of providing for the individual bearings for the lower gate stems. The possibility of excessive warpage and the cumulative errors in assembling would be increased perhaps so much that additional allowance for finish would be required. There would also be more shop handling for positioning welds. By using a casting in the assembly, the number of individual pieces was reduced by 60 per ring, the shop time was cut considerably and there was no difficulty in securing the desired shape. The cost comparison favoured the use of a casting.

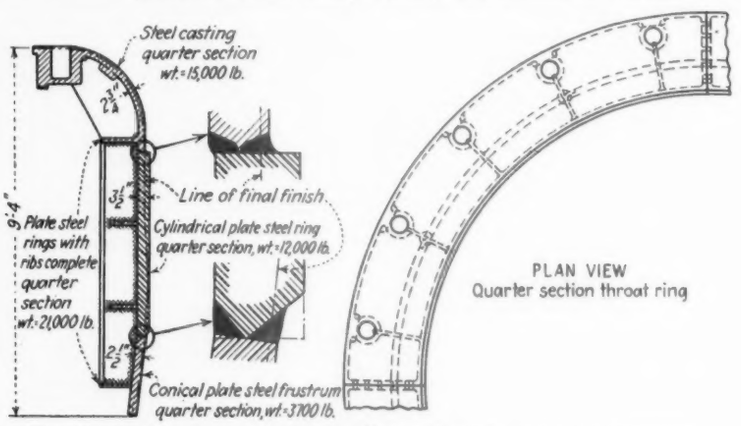

FIG. 1.—UNIT FOR AN ADJUSTABLE-BLADE TURBINE WHICH JUDICIOUSLY COMBINED CAST STEEL AND ROLLED STEEL.

Machining Allowances

It is interesting to note that previous experience with this type of heavy structure indicated that the stock allowance for machining would be no less if the pressed plates had been used instead of the casting.

Another example where composite construction is used in turbine parts is in the Francis turbine runner. This runner is composed of a pre-machined cast steel crown weighing 58 cwts., and a pre-machined cast steel band weighing 51 cwts., together with twelve hot-formed runner buckets of ⅞-in. steel plates weighing 62 cwts., making a total weight for the entire unit of 8.6 tons. By using plates for the construction of the buckets it was possible to obtain sufficient strength with thinner material than would have been obtained had the buckets been cast. The use of the thinner material increased the vent or cross-sectional area of the water passages, thus increasing the turbine output. The pre-machining of the crown and band to exact size and shape and to a smooth surface not only allows for more perfect assembly of the runner buckets, but also produces a better balanced runner.

Before welding was available this type of runner was most frequently made in one solid casting, using cores for all of the mould excepting the crown and hub structure. The castings required when composite construction was utilised in building the runner were much simpler to make, the cost was considerably less and the possibility of having to build up, chip and grind for the balancing of the runner buckets was avoided.

Wicket Gate

Fig. 2 shows a fabricated wicket gate or adjustable guide vane which employs the use of formed plates for the gate proper and castings for the gate stems. An entire gate of cast steel would be acceptable here, although the gate as shown is somewhat lighter than would have been the case if it had been cast. The cost would have been about equal in both cases. By using a composite construction, however, it was possible to utilise the existing shop equipment and keep most of this work in the author's works. Pressing dies were required for the side walls, but in this case the die cost was spread over 36 gates, the same as the pattern cost would have been. The surfaces on the castings which were to be welded to the plate were bossed ⅛ in. high and ground to bright metal at the foundry. Here is a case where the use of composite construction permitted the execution of the work with existing shop equipment at no additional cost.

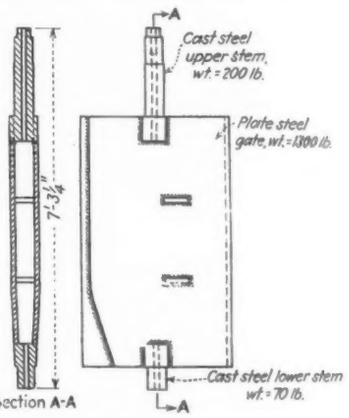

FIG. 2.—WICKET GATE OF COMPOSITE CAST-STEEL AND ROLLED-STEEL CONSTRUCTION.

While in very many cases it would be possible completely to fabricate with structural shapes and plates, the result might be unpleasing to the eye, and the cost would probably be out of proportion to what it should have been, had some castings been used. Unless all of the available materials for construction, including castings, are considered, manufacturers and fabricators are overlooking important factors in sound and economical designs.

* "Iron Age" abstract of a Paper read before the Philadelphia Chapter of the American Welding Society. The author is attached to the engineering department of the S. Morgan Smith Company, York, Pa.

Influence of Moisture Content of Moulding Sand on Strength Properties of Cast Aluminium Test Bars*

By C. GIERDZIEJEWSKI

Factors which influence the strength properties of a sample with a determined chemical composition are: physical composition of metal (ingots of virgin metal, scrap, runners, etc.); order of charging; type of furnace and fuel; treatment of the liquid metal; temperature and the time of melting; temperature and the procedure of casting, and finally the shape of the sample.

With a more attentive and more constant control of mechanical properties, particularly in aluminium and magnesium foundries, in spite of the precise stabilisation of the above factors, the results given by test-pieces cast from metal melted in identical conditions show very serious differences. These differences are quite small

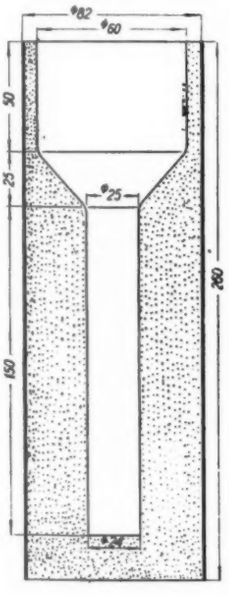

Fig. 1.

when testing chill-cast samples, but they are relatively important with sand-cast samples.

At the International Foundry Congress in Prague in 1933, a Paper dealing with this subject was presented by Dr. H. Lepp,[1] who was the first to raise this question. According to Lepp the reasons for variations of strength properties are of a chemical order, and depend above all on the moisture content of the moulding sand used for making either the moulds or the cores. The steam produced under the influence of molten metal easily reacts with metal, forming oxides according to the formula $H_2O + Me = MeO + H_2$, where Me = metal. The author considers the conditions of the strength of the chemical reaction according to the temperatures and concentration of reactive substances. He has examined the dependence of the intensity of the reaction, from the chemical nature of the metal, from the partial pressure of steam, from the temperature, etc. He has compared the physical properties (latent heat of fusion, specific heat) of different metals and alloys, as well as physical properties of dry and green moulding sand (conductivity, specific heat, etc.) and has arrived at the conclusion that in certain conditions, with insufficient consideration of the design of casting, during the construction of the running system, some entirely enclosed spaces can be formed in sand moulds which render suitable heat conduction more difficult. Therefore the conditions may favour the local elevation of temperature and pressure. If to this is added a local accumulation of the metal, actually produced because of the make-up of the casting itself, one can find defects not only on the surface of the casting, but often internally, caused by the oxidation of the metal.

Lepp's conclusions were confirmed by tests on some of the bronzes.

The work of E. Longden[2] raises the question of the influence of the type of moulds on the strength properties of bronzes. He says that the Brinell hardness of a sample cast from bronze (Cu 87.75; Sn 12.7, and P 0.25 per cent.) in green sand was 60, whereas for a sample cast in a dried mould it was 64. The specific weight, characterising the degree of absorption of gas, was in the first case 8.24 and in the second 8.385.

Dr. Väth[3] has examined the influence of the moisture content of the mould on the mechanical properties of iron of the composition T.C 3.2, Si 2.4, Mn 0.7, P 1.4 and S 0.1 per cent., and on the form of the graphite in the fracture. This work shows that the reduced moisture content of the moulding sand in reference to the optimum moisture reduces the transverse strength and the deflection by about 10 per cent., and the average hardness measured on the same place in the casting is higher by about ten to twelve Brinell units for castings made in green moulds. This is explained by the higher thermal conductivity of the green sand and, because of this, quicker cooling.

The Report of the Technical Committee of the A.T.F.B.[4] dealt with the influence of moulding sand on the properties of iron, and confirmed that the addition of linseed oil to the moulding sand had a hardening influence, which in this case gave an increase of 15 to 20 Brinell units. This was explained by the increased thermal conductivity of the moulding sand, even when compared with a properly-made green-sand mould.

The author does not know of any Papers dealing with the influence of moulding sand on aluminium alloys, but doubtlessly this influence is more pronounced than in the case of copper alloys.[5] Reference should be made, however, to the tests of Schreiber and Menking[6] on conditions of casting of magnesium alloys. These

Table I.—*Composition and Properties of Alloys Tested.*

Type of alloy.	How cast.	Composition.							Impurities.						Heat-treatment.		Strength properties.		
		Cu	Ni	Mg	Si	Fe	Ti	Sn	Zn	Pb	Si	Fe	Mn	Misc.	Time and temp. of heating.	Method of cooling.	R_T, kg./ sq.mm.	A, per cent.	B_1H.
Al-Cu6	Chill ..	6–8	—	—	—	—	—	0–1.0	max. 0.1	max. 0.1	max. 0.7	max. 0.8	—	—	3 hrs. at 350 deg. C.	Room temp.	min. 14.5	min. 3	—
Al-Si10	Chill ..	—	—	—	10 –14	—	—	—	—	—	—	max. 0.75	max. 0.5	max. 0.1	3 hrs. at 250 deg. C.	Room temp.	min. 19	min. 7	—
	Sand ..	—	—	—	10 –13	—	—	—	max. 0.1	—	—	max. 0.6	max. 0.5	max. 0.1	—	—	min. 16.5	min. 5	—
RR50 ..	Chill ..	1.15 –1.4	1.2 –1.4	0.07 –0.12	2.05 –2.35	0.9 –1.1	0.05 –0.25	—	—	—	—	—	—	—	16–20 hrs. at 155–175 deg. C.	In water ..	min. 19.5	min. 4	60–80
	Sand ..	0.8 –2.0	0.8 –1.75	0.05 –0.3	1.5 –2.8	0.8 –1.4	0.15 –0.2	—	—	—	—	—	—	—	8–16 hrs. at 155–175 deg. C.	In water or room temp.	min. 17	min. 2.3	—

Table II.

h.	l.	V.	T.	Q′.	Q.	γ app.	π.	h.	l.	V.	T.	Q′.	Q.	γ app.	π
Per cent.	cm.							Per cent.	cm.						
0	5	98.2	—	—	146.5	1.492	45	5	5	98.2	220.5	357.3	136.8	1.39	65
,,	,,	,,	—	—	139.2	1.418	57.3	,,	,,	,,	,,	366.8	146.3	1.49	42.8
,,	,,	,,	—	—	125.3	1.271	98	,,	,,	,,	,,	375.4	154.9	1.58	39.3
,,	,,	,,	—	—	134.9	1.374	65.5	,,	,,	,,	,,	359.3	138.8	1.41	54.5
,,	,,	,,	—	—	141.7	1.445	51.5	,,	,,	,,	,,	350	129.5	1.32	95
,,	,,	,,	—	—	133.7	1.363	75	7	,,	,,	,,	371.7	151.2	1.54	53.8
,,	,,	,,	—	—	131.2	1.339	92	,,	,,	,,	,,	354.4	132.5	1.36	136
3	,,	,,	220.5	366.2	145.7	1.49	46.3	,,	,,	,,	,,	359	138.5	1.42	88
,,	,,	,,	,,	364.7	144.2	1.47	56	,,	,,	,,	,,	352	131.5	1.34	150
,,	,,	,,	,,	362.8	142.3	1.45	64	,,	,,	,,	,,	357.7	137.2	1.40	102
,,	,,	,,	,,	358.8	138.3	1.41	65	9	,,	,,	,,	360	139.5	1.42	164
,,	,,	,,	,,	370.3	149.8	1.525	34	,,	,,	,,	,,	355.1	134.6	1.37	171
,,	,,	,,	,,	381.7	161.2	1.64	12	,,	,,	,,	,,	368.6	148.1	1.51	93
,,	,,	,,	,,	375	154.5	1.575	16	,,	,,	,,	,,	362.8	142.3	1.45	140
								,,	,,	,,	,,	380.7	160.2	1.63	40

Q = weight of sample in g. V = volume of sample in c.c. T = weight of tube in g. Q′ = weight of tube with sand.

* Paper presented at the International Foundry Congress held in Poland last month. The author is director of the Foundry Institute, Polytechnic High School, Warsaw; President of the Polish Foundry Technical Association, and Vice-President of the Technical Military Association.

alloys can only be cast into moist moulds, because the low thermal conductivity of dry sand causes a very great reduction of mechanical properties due to the formation of a coarse grain structure.

For the above reasons it was decided to make a series of tests in order to confirm the influence of the moisture content on the strength properties of samples cast from different aluminium alloys.

Test-bars cast from Al-Cu6, Al-Si10 and Hiduminium RR50 alloys were tested with moisture contents in the moulding sand ranging from zero to 9 per cent. With a moisture of 12 per cent. it was impossible to make castings. As a comparison a sample cast in a metal mould was used. Standard specifications of tested alloys are detailed in Table I.

This table is amplified by the following notes. Chill specimens were cast into iron moulds of 25-mm. inside diameter and 200 mm. long. The wall thickness of the mould was 12 mm. The bottom hole was closed up with clay or sand. Before casting the die was heated up. During casting the chill mould was inclined at an angle of 60 deg. relative to the perpendicular, and no risers were used. Sand test-bars were cast into sand moulds of the dimensions given in Fig. 1. The mould was heated up by a gas burner directly before casting, so that the temperature of the mould was about 30 to 40 deg. C. The Al-Si alloy was modified.

All test-bar moulds were made from one moulding sand, with the permeability and strength properties controlled, leaving moisture content as the only variable. The moulding sand was used 18 to 20 hours after it was prepared and moistened, and the loss of moisture content through desiccation was measured and an appropriate percentage of water introduced. Before use the moulding sand was tested for moisture by means of a "Speedy" moisture tester, an apparatus well known to foundrymen. The final moisture content was controlled to within 0.5 per cent. The properties of the dry moulding sand depend, as is well known, upon the moisture content before drying. To eliminate the influence of preliminary moisture the moulding sand batch of the same moisture content was used (6 per cent.), and moulded samples were dried in a laboratory muffle at a temperature of 150 deg. C. for two hours. This experiment showed that in these conditions one attains the best drying of the mould.

A great influence on permeability of the moulding sand is, in addition to moisture, the degree of ramming. In order to eliminate the influence of this factor, the following procedure was applied. As the direct measuring of the degree of ramming of the mould (because of its shape and other difficulties) could not assure an exact control of the uniformity of all moulds, it was decided to substitute the measuring of the degree of this ramming by establishing the apparent specific gravity of the rammed moulding sand. The shape of this mould, as well as of the pattern used, rendered it easy. The curves of relationship between the apparent specific gravity and permeability at constant moisture for the used moulding sand are shown in Fig. 2, and are traced from five determinations for every moisture content. Specimens were prepared with the aid of a wooden hand rammer, normally used in foundries, in the tube used with the standard A.F.A. rammer. The height of the sample was established at 50 mm. Weighing the tube with the rammed sand, with a tolerance of 0.5 g., and knowing the weight of the empty tube, the apparent specific gravity can easily be determined. Permeability (π) was determined by an A.F.A. meter by H. Dietert.

TABLE III.

No.	No. of melt.	Alloy.	Chemical analysis. Cu	Si	Fe	Ni	Mg	Ti	Pouring temp.	Max. temp.	Mould. State.	h	γ	π	Strength. R_r.	A.	B_rH.	Average values from 3 melts. R_r.	A.	B_rH.
												Per cent.	App.			Per cent.			Per cent.	
1	1	Al-Cu 6	6.37	0.46	0.29	—	—	—	700°	750°	Dry from 6 per cent.	0	1.31	96.0	12.8	0.75	—	12.04	0.79	61.7
2											Green ..	3	1.50	43.5	14.9	1.45	—	13.20	1.33	61.7
3											,, ..	5	1.47	43.5	14.7	1.45	—	13.81	1.51	65.6
4											,, ..	7	1.41	73.5	13.1	0.75	—	13.28	1.27	62.4
5											,, ..	9	1.56	68.5	16.6	2.55	—	14.55	1.88	59.5
6											Chill ..	—	—	—	17.6	3.65	—	17.45	4.27	60.9
7	2	Al-Cu 6	6.35	0.42	0.28	—	—	—	700°	750°	Dry from 6 per cent.	0	1.32	95.0	12.3	1.10	—			
8											Green ..	3	1.50	43.5	13.2	1.80	—			
9											,, ..	5	1.46	44.0	15.2	2.35	—			
10											,, ..	7	1.41	79.5	14.4	1.80	—			
11											,, ..	9	1.54	77.5	14.6	2.00	—			
12											Chill ..	—	—	—	16.0	3.45	—			
13	3	Al-Cu 6	6.38	0.45	0.28	—	—	—	700°	750°	Dry from 6 per cent.	0	1.30	97.0	11.0	0.54	61.7			
14											Green ..	3	1.49	47.5	11.5	0.73	61.7			
15											,, ..	5	1.38	71.0	11.5	0.73	65.5			
16											,, ..	7	1.45	58.0	12.3	1.27	62.4			
17											,, ..	9	1.54	77.0	12.4	4.10	59.5			
18											Chill ..	—	—	—	18.8	5.70	60.9			

TABLE IV.

No.	No. of melt.	Alloy.	Chemical analysis. Cu	Si	Fe	Ni	Mg	Ti	Pouring temp.	Max. temp.	Mould. State.	h	γ	π	Strength samples. R_r.	A.	B_rH.	Average values from 3 melts. R_r.	A.	B_rH.
												Per cent.	App.			Per cent.			Per cent.	
1	1	Al-Si 10	—	10.14	0.32	—	—	—	690–700°	750°	Dry from 6 per cent.	0	1.42	55.5	17.1	14.7	—	17.20	17.75	49.6
2											Green ..	3	1.50	45.5	17.3	15.8	—	17.35	16.30	47.0
3											,, ..	5	1.42	49.5	17.4	14.5	—	17.62	16.65	51.9
4											,, ..	7	1.50	54.0	9.4*	1.0*	—	18.15	16.05	54.3
5											,, ..	9	1.55	73.0	16.2	7.1	—	16.90	12.50	49.1
6											Chill ..	—	—	—	20.7	8.2	—	21.20	12.05	49.6
7	2	Al-Si 10	—	9.83	0.40	—	—	—	690–700°	750°	Dry from 6 per cent.	0	1.40	59.0	17.3	18.7	49.6			
8											Green ..	3	1.47	56.5	17.4	16.0	47.0			
9											,, ..	5	1.44	45.0	17.7	18.4	51.9			
10											,, ..	7	1.47	54.0	18.2	17.1	54.3			
11											,, ..	9	1.60	51.5	17.6	17.8	49.1			
12											Chill ..	—	—	—	21.6	11.6	49.6			
13	3	Al-Si 10	—	10.0	0.45	—	—	—	690–700°	750°	Dry from 6 per cent.	0	1.40	59.0	17.2	17.8	—			
14											Green ..	3	1.50	47.5	17.6	17.1	—			
15											,, ..	5	1.47	43.5	17.7	17.1	—			
16											,, ..	7	1.50	54.0	18.0	15.0	—			
17											,, ..	9*	1.52	90.0	—	—	—			
18											Chill ..	—	—	—	21.5	16.5	—			

* Sample porous.

As all these moulds were made as shown in Fig. 3, the determination of γ for a mould did not give any difficulties, and when using diagrams shown in Fig. 2, it was not difficult to determine the mean permeability of the mould, and eliminate all moulds which showed any divergence in apparent γ due to unsatisfactory ramming. No doubt π determined in this way is not to be regarded as tests made on the normal A.F.A. instrument.

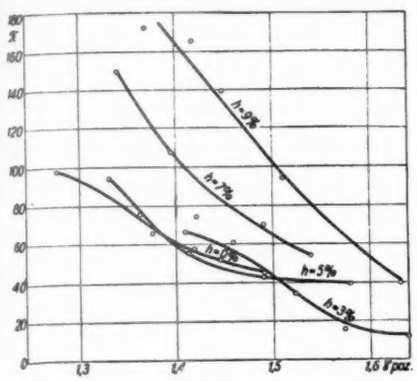

Fig. 2.

For the Al-Cu6 and Al-Si10 alloys the metal for the samples was melted in a laboratory gas-fired furnace, whilst the RR50 alloy was melted in oil-fired furnaces in the actual foundry.

The melting of Al-Cu6 and Al-Si10 alloys was carried out in all cases under identical conditions, the time and the casting temperature being controlled. In order to eliminate its influence, the time of pouring samples was established at 10 secs., and was strictly observed. Six samples were cast simultaneously according to moisture contents of 0, 3, 5, 7 and 9 per cent., and, in addition, one chill sample was cast. Each experiment was repeated three times. After casting the chill sample was taken out of the mould, while the sand-cast samples were left in the moulds for 40 mins., and, when taken out, were allowed to cool down to room temperature.

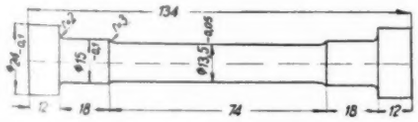

Fig. 3.

The samples were not heat-treated. (See Table II.)

The specimens for the tensile test were machined to the form shown in Fig. 3. For breaking the specimens an Amsler testing machine was used and the hardness was tested on the Brinell machine. The results of these experiments are detailed in Table III, giving the chemical composition, characteristics of the mould and strength properties. It is supplemented by the diagram, Fig. 4, giving average values of the results shown.

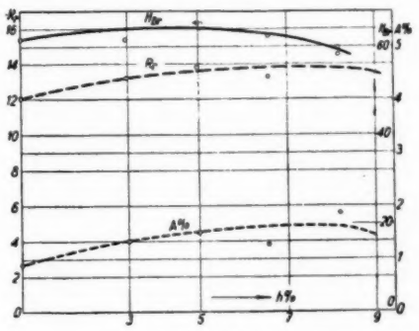

Fig. 4.

Under the microscope it is seen that the increase of moisture is followed by a grain refinement and an increase of porosity. Thus, the conclusion is reached that the advantageous influence of grain refinement is counterbalanced by the influence of the increase of porosity. The tests on Al-Si10 alloy were made on the modified alloy, and three melts of this alloy were made with six test-bars from each, similarly to the above, with the observation of all precautions necessary to eliminate the influence of factors not essential for the research. The results are assembled in Table IV, and supplemented by the diagram given in Fig. 5.

This table confirms a definite relationship between the strength properties of test-bars of Al-Si10 alloy and the moisture content of the mould. The increase in the moisture favours the increase of R_r (tensile strength) and the decrease of A per cent. (elongation), and has no influence on B_rH (Brinell hardness). Test-bars cast in chill moulds have higher tensile strengths than when cast in sand, but the elongation is lower as the rapidity of cooling of the chill-cast sample is highest, and of the sand-cast sample in a dry mould the lowest. Between these two test-bars often exists the highest divergence of test results on mechanical properties. Eliminating samples showing defects, it can be supposed that the moisture content of the mould has an important *rôle* on strength properties. Microphotographs confirm that the increase of moisture is followed by a refining of the solid solution of Si in Al, which no doubt has an influence on the mechanical properties of the alloy. Test-bars from Hiduminium RR50 alloy were cast from material melted directly in the foundry and not in the laboratory. It permitted the lengthening of the time of pouring up to 25 secs. At the same time a greater quantity of melted metal was available. Samples were not heat-treated, but it was decided that the mechanical tests should be carried out on the eighth day from the day of casting, in order to have even conditions of natural ageing for all samples. Three sets of castings, six of each, were made. The results of the experiments are shown in Table V and Fig. 6.

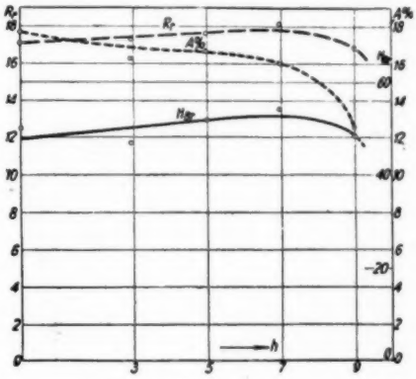

Fig. 5.

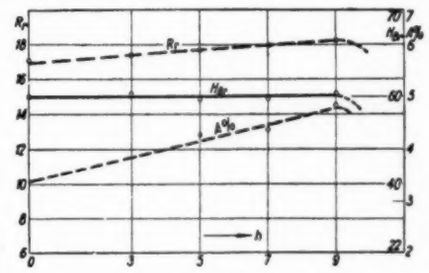

Fig. 6.

Table V.

No.	No. of melt.	Alloy.	Chemical analysis. Cu	Si	Fe	Ni	Mg	Ti	Pouring temp.	Max. temp.	Mould. State.	H_2O.	γ	π	Strength samples. R_r.	A.	B_rH.	Average values from 3 melts. R_r.	A.	B_rH.
												Per cent.	App.			Per cent.			Per cent.	
1	692	RR-50	1.43	1.95	1.14	0.89	0.10	0.13	710°	730°	Dry from 6 per cent.	0	1.36	72	17.45	3.65	61.5	17.5	3.52	61.5
2											Green ..	3	1.47	58	18.15	3.45	61.5	17.7	3.83	61.5
3											,, ..	5	1.47	43.5	18.45	4.70	60.5	17.95	4.37	60.5
4											,, ..	7	1.45	59.5	19.10	5.10	60.5	18.2	4.44	60.5
5											,, ..	9	1.52	85	18.80	4.75	61.5	18.55	4.92	61.5
6											Chill ..	—	—	—	18.70	4.00	57.7	19.3	4.74	57.0
7	727	RR-50	1.41	2.03	1.13	0.92	0.10	0.13	710°	730°	Dry from 6 per cent.	0	1.32	95	16.80	4.00	—			
8											Green ..	3	1.46	61	17.75	4.55	—			
9											,, ..	5	1.45	44	17.75	4.55	—			
10											,, ..	7	1.47	54	17.75	4.00	—			
11											,, ..	9	1.50	98.5	19.00	5.65	—			
12											Chill ..	—	—	—	19.90	6.0	—			
13	772	RR-50	1.45	2.09	1.13	0.89	0.11	0.13	710°	730°	Dry from 6 per cent.	0	1.35	85	16.90	2.90	—			
14											Green ..	3	1.46	61	17.50	3.50	—			
15											,, ..	5	1.45	44.5	17.7	3.80	—			
16											,, ..	7	1.42	73	17.8	4.20	—			
17											,, ..	9	1.49	110	17.90	4.35	—			
18											Chill ..	—	—	—	19.40	4.20	—			

(*Concluded on page* 292.)

Pneumatic Tools for Foundry Purposes

It is only natural that pneumatic tools should be used on an extensive scale in the works of Broom & Wade, Limited, of High Wycombe, as they are air-compressor and pneumatic-tool manufacturers. The most important applications of these tools are in the foundry, where they help considerably towards reducing production costs and increasing the quality and output of air compressors.

Fig. 1 illustrates a corner of the foundry, and it is of interest in that it shows not only the application of pneumatic sand rammers and plumbago spray guns, but also the way in which compressed air is brought down to the tool. Only a short length of flexible hose is employed, and this is coupled to a small "Swartwout" moisture separator, seen on the extreme left, fitted at the end of the vertical air main. This lay-out reduces possibility of air leakage to a minimum and, as the moisture is eliminated from the air, increases the efficiency of the tool.

Fig. 2 shows a section of the fettling and dressing department where pneumatic tools are employed for finishing compressor castings. The majority of these castings are of intricate nature and demand the use of a large number of cores. Although for removing cores from small castings probing with a bar is generally sufficient, the removal of cores from large castings is greatly facilitated and quickened by the use of pneumatic picks, as shown. Gates and risers are removed with pneumatic chipping hammers which are also used for removing surface irregularities. For finishing external surfaces of large castings, pneumatic grinders are employed fitted with 6-in. or 4-in. diameter bakelite-bonded grinding wheels running at a speed of 5,500 to 8,000 r.p.m. Small castings are finished in a blast-cabinet with an air-pressure of about 60 lbs. per sq. in. and silica sand.

In addition to the tools illustrated in Figs. 1 and 2, this firm also uses in its foundry rotary wire brushes, sanders, polishers, blow guns and various other pneumatic tools and appliances of its own design and manufacture.

FIG. 1.—VIEW IN THE BROOM & WADE FOUNDRY SHOWING THE APPLICATION OF PNEUMATIC HAND TOOLS.

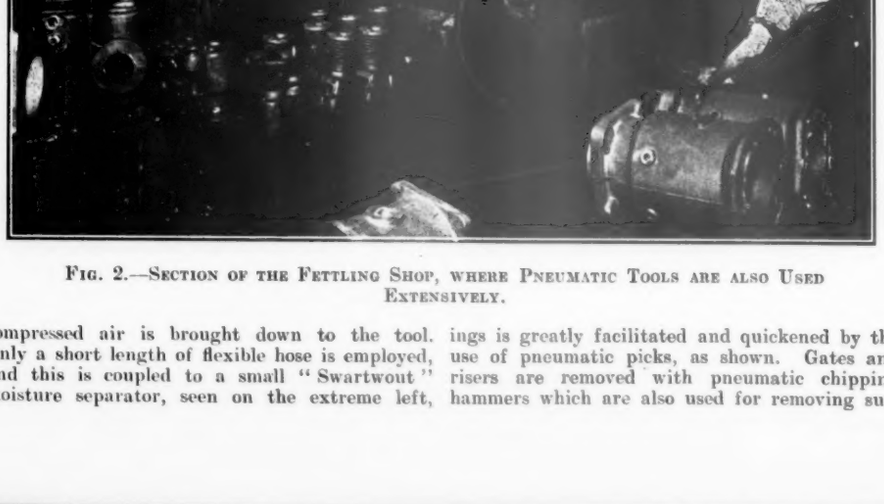

FIG. 2.—SECTION OF THE FETTLING SHOP, WHERE PNEUMATIC TOOLS ARE ALSO USED EXTENSIVELY.

Influence of Moisture Content of Moulding Sand on Strength Properties of Cast Aluminium Test Bars

(*Concluded from page* 291.)

When analysing these results a relationship is again disclosed between the moisture content of the mould and the mechanical properties, particularly elongation. Formation of porosity with an increased moisture is still pronounced, with the exception of the sample No. 4 having a moisture content of 7 per cent., which showed exceptional strength properties (higher than that of the chill-cast test-bar), and which is regarded as accidental.

The experiments permit one to draw the conclusion that for aluminium alloys there exists a relationship between the moisture content of the mould and the strength properties of the casting. This relationship was very distinct, especially under the microscope, and was indicated by an important refinement of the structure when casting into the damper moulds.

Fine-grained structure influences the increase of the strength properties, but excessive moisture causes the making of a sound casting impossible.

However, the chemical oxidising influence of moisture contained in the moulding sand on the properties of castings was not examined, but it seems that the above experiment does not on the whole confirm the suppositions of Lepp.

In the case of the aluminium alloys tested, the influence of the moisture and the increased cooling rate balance the influence of increased porosity, and of the increased quantity of oxides in the metal, and so, in actual foundry practice, there can be accidents when, with an increased moisture, there can be better mechanical properties in the castings.

These investigations have shown that the influence of the permeability of the mould on strength properties, within the limits of normal permeabilities, is not very great and need not be taken into consideration.

It would be advantageous to complete the above by tests on the mechanical strength properties of samples cast integrally with the castings, and made in moulds from moulding sand with different permeabilities, and to determine the conditions in which the reaction $2Al+3H_2O \rightarrow Al_2O_3+3H_2$ occurs in the metal during solidification.

The experimental part of the above work was carried out by Mr. T. Michalowski, whom the author thanks for his assistance.

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New B.C.I.R.A. Members

The following firms have been elected members of the British Cast Iron Research Association. In brackets are given the names of these firm's representatives:—Austral Sheet Metal Works, Limited, Thebarton, South Australia (Mr. E. Fleming); Cochrane & Scott Proprietary, Limited, South Melbourne, Australia; McGregor Brothers, Limited, Leigh (Mr. E. R. Sutcliffe), and McIlwraith Industries Proprietary, Limited, Sydney, N.S.W., Australia (Mr. H. Slater).

Electrical Accidents in Industry*

PORTABLE APPARATUS AND STEELWORKS PLANT

An interesting publication Form 929* entitled "Electrical Accidents and their Causes, 1937," has been issued by the Home Office. It deals with the electrical industry generally, including the electric supply industry.

Table I gives the reportable electrical accidents in relation to apparatus in 1937.

Switchgear.—It will be noted that a greater number of accidents are associated with switchgear than with any other class of electrical apparatus. Of a total of 152 accidents 9 proved fatal. In the case of switchgear below 650 volts a large number of the accidents are caused by the use of metal tools on live equipments, with the result that accidental short-circuits occur and the majority of the injuries in this class of accident is burns.

TABLE I.—*Reportable Electrical Accidents in Relation to Apparatus*, 1937.

Apparatus.	Fatal.	Non-fatal.		Total.
	Men.*	Men.	Women.	
Electrical machinery	—	16	2	18
Transformers	1	6	—	7
Switchgear above 650 volts	7	25	—	32
Switchgear below 650 volts	2	116	2	120
Fusegear	—	40	—	40
Crane trolleys	7	22	—	29
Electric welding	—	69	—	69
Portable electric machines	3	17	1	21
Portable heaters and irons	—	4	2	6
Portable lamps	—	7	—	7
Fixed lamps	3	15	—	18
Plugs and adaptors	—	29	7	36
Cables and flexibles	7	74	9	90
Electrical ignition of inflammable materials	1	18	3	22
Testing	3	45	1	49
Other apparatus	2	17	—	19
Total	36	520	27	583

* No fatalities to women.

Cables and Flexibles.—After switchgear, cables and flexibles are responsible for the next largest number of accidents, and of a total of 90, 7 proved fatal. The accidents can be divided into two groups—:(1) Defective flexible cable used in conjunction with portable apparatus; (2) damage to temporary or inadequately protected wiring.

Of the first group, a considerable number of accidents are due to failure of the flexible cable at a point of entry into either the tool itself or the plug connector. Sufficient attention is still not given to the prevention of undue strain on the cable at this point. A properly-designed reinforcing rubber sleeve and cable grip would not only relieve the cable of tension, but also prevent the continual severe bendings at one point which by shortening the life of the cable contribute to accidents. It must be remembered, however, that even with reinforcing sleeves supervision and maintenance are still necessary.

The second group of accidents generally occurs in connection with temporary wiring, and a number of the accidents which occur each year take place on buildings in course of construction. Temporary wiring by its very nature is especially susceptible to damage, particularly when heavy plant is being moved about, and too much attention and care cannot be taken in deciding its location and in watching for and averting the possible means by which it may be damaged.

Electric Welding.—The number of accidents in connection with electric welding shows a small increase. As before, however, the majority of these accidents are eye flash which is seldom followed by very serious effects. In a number of cases screening has been inadequate and in others, workers assisting welders have not made use of goggles provided for the purpose of protecting the eyes. One or two cases have occurred in which a worker has received an electric shock, either due to a badly-constructed electrode holder, or as a result of a welder placing a live electrode on a piece of non-earthed metal.

Fuse Gear.—Accidents in connection with fuse gear are either due to inadequate performance of the fuse while the holder is being inserted or withdrawn, or to short-circuits at distribution boards due to workers accidentally causing a short-circuit when connecting or disconnecting cables. With regard to the performance of the fuses, one or two instances have occurred in which clearance between the end fuse of a row and the metal case has been too small, thus setting up arcing to the case when the fuse blows.

Crane Trolleys.—Crane trolleys continue to be a source of many accidents and out of 29 accidents, seven proved fatal. Mistakes and misunderstandings regarding the switching of the supply to trolley wires are the cause of many of the accidents, together with failure to isolate when workers are instructed to work near the wires.

Table II shows the fatalities in relation to pressure, and it will be noted that two deaths were attributed to direct current between 250 and 650 volts, and one to static electricity. One of the fatalities was due to electric shock at 550 volts under wet conditions, the other was due to the bursting of an overspeeding direct-current motor. The fatality attributed to static electricity was brought about by the ignition of petrol while the deceased was rinsing a garment of wool and artificial silk in a rinsing pan.

Portable Electrical Apparatus

A number of accidents, some with fatal results, generally at 200/250 volts alternating current, occur each year due to failure of the earth connection on portable electric tools. A break in the supply wires in the flexible cable stops the tool and receives immediate attention, but to ensure the existence of earth continuity frequent test is necessary unless an automatic device is provided. In one works, for example, it was elicited during the investigation of a fatal accident that the earth wire in portable flexes was tested only when complaints of shock were received. Although different aspects of earthing portable tools has been stressed on many occasions, it may not be inopportune to review briefly the precautionary measures available against electric shock.

(1) *Pressure Reduction.*—The use of low voltage offers a high, although not complete, degree of immunity, as well as economic advantages in maintenance costs against insulation breakdown and failure at the reduced pressure. There may be difficulties in the way of adopting very low pressure for portable tools, but voltages of the order of 50/100 volts are practicable, and if the mid-point of the supply transformer winding is connected to earth, the shock voltage thereto is halved.

(2) *Insulated Construction.*—The all-insulated portable tool provides obvious safeguards where reduced pressure is not available, but owing to the nature of most insulating materials it may be unsuitable where liable to extreme rough usage. The rapid development in insulation technique may, however, widen the scope.

(3) *Automatic Protection of Earth Connections.*—This appears to provide the most effective of safeguards, but additional equipment is necessary to enable the supply to the portable tool to be controlled by means of a contactor, the operating coil of which is energised by means of low-voltage supply obtained from a transformer or battery. The flexible cable requires one core extra to those normally used for supply and earth connection. The additional core and the earth core form part of the contactor operating-coil circuit, so that discontinuity in either of them causes the supply automatically to be cut off from both portable tool and flexible cable. The operation of the tool is controlled by a press switch on the handle connected in the contactor-coil circuit.

Other Causes of Accidents

Travel Limit Switching Devices.—Continued attention has been given to this important subject in view of the accidents which occur and the danger which may follow failure of limit switches installed on cranes to prevent overwinding and breakage of ropes. In a number of mechanisms examined this year defects have again been observed both in design and due to inadequate maintenance. At one works, for instance, tests carried out resulted in four failures out of six attempts to operate the limit switches by overwinding.

TABLE II.—*Reportable Electrical Fatalities in Relation to Pressure*, 1937.

System.	Voltage.	Fatalities.
A.C.	Over 10,000	7
A.C.	5,000–10,000	2
A.C.	650–5,000	1
A.C.	250–650	16
A.C.	Below 250	7
D.C.	250–650	2
Static	—	1
Total	—	36

Steel-Furnace Chargers.—A somewhat allied problem as regards travel control arises in connection with steel-furnace charging machines. Normally braking of the travel and slewing motions is effected by reversing the controllers, but should the trolley wire supply fail on account of the main switch tripping on overload or for other reasons, the operator loses control. Cases have occurred of workmen being crushed by "run away" chargers. The general construction of the machines makes the application of straight mechanical braking almost impracticable, but a feasible solution lies in the application of electrical braking, either in the form of the solenoid-brake type or of the rheostatic-resistance pattern. Some equipments are already in use and operating satisfactorily, and it is hoped that this danger will eventually be eliminated.

High-Frequency Induction Furnaces.—During the course of the year the most important activity in connection with electric furnaces has been the study of conditions likely to cause a jet of water to enter the molten steel in the crucible of an induction furnace if a crucible wall fails. In the past some doubt has been expressed as to the possibility of such an occurrence. When it is remembered, however, that cooling water escaping from a punctured inductor coil into a break in the lining may have kinetic energy equivalent to 60 to 100 lbs. per sq. in., it is seen that it can easily penetrate the molten steel, and becoming rapidly evaporated may expel red-hot metal or slag from the crucible with considerable violence. Following one or two

* H.M. Stationery Office, York House, Kingsway, London, W.C.2. (Price 9d. net.)

dangerous failures of this type, in which very fortunately no one was seriously hurt, a number of visits were made early in the year, the results of which are summarised in Table III, which gives some particulars of failures which were found to have occurred up to that time in five works.

Of some 25 shops or furnaces in use in one area, the trouble has occurred in at least five, and at three works the results appeared to have been potentially very dangerous. At one place the metal blown out damaged an optical pyrometer in the hand of a metallurgist who was about to take a reading of the furnace temperature. Since also the failures appeared to be increasing in frequency, it is gratifying to learn that some progress has been made towards developing automatic electric signals which it is hoped will give sufficient warning of trouble to prevent accidents. Experience already gained emphasises the need for such safety devices to be tested regularly, and preferably automatically

TABLE III.—*Accidents on High-Frequency Electric Furnaces due to Water Leakage.*

Size of furnaces.*	Lining.	Water in steel.	Remarks.
S. and M.	Acid	Twice	Three years ago.
S. and M.	Basic	Once	Four years ago.
(i) S. and M.	Basic	Once	Some years ago.
(ii) S. and M.		Once ..	1937.
S	Basic	Once	1936.
L	Basic	Six times	Three times early in 1937.

* S = up to approx. 5 cwts. M = 10 or 20 cwts. L = 2 to 5 tons.

during the working of the plant. Much, however, remains to be done in improving the mechanical properties of basic-refractory linings and inductor-coil construction, since from all points of view, it is better that the initial failure should not occur, and an obvious line of progress is for automatic equipment, which will shut down the plant or otherwise bring about safe conditions, to be added to the warning.

It is important at this stage to point out that the danger under consideration is distinct from the risk of electric shock, and precautions suggested up to the present do not in any way modify the necessity of providing an "earth-free" working platform for the furnace. It also appears from the account of a fatality in another country that on balance the danger of fatal electric shock will be reduced if the inductor circuit is operated non-earthed. At one place where this is done, a centre-reading electrostatic voltmeter is connected to the mid-point to indicate insulation failures.

International Ferro-Silicon Syndicate

It is announced that the International Ferro-Silicon Syndicate has now been prolonged for one year to September 30, 1939; prices are to remain unchanged. Makers in Sweden and Norway, who had for some time held aloof from the Syndicate, have now again joined the organisation, except for one Norwegian producer, with whom negotiations are still proceeding. The Syndicate has an agreement with the American makers according to which the latter are not to sell in Europe, while the European producers will not deliver in America. The Swedish producers are:—A.B. Ferrolegeringar, of Stockholm; Gullspangs Elektrokemiska, A.B.; A. Karlson Metall & Maskin A.B., of Stockholm, Stockholms Superfosfat Fabriks, A.B.; and Wargons A.B.

New Alloy Works at Redditch

Work has commenced in Windsor Road, Redditch, in building a factory which will, it is hoped, provide employment for some hundreds of men. It is being built by High Duty Alloys, Limited, and their associated company, Magnesium Castings & Products, Limited, who have works at Slough.

Institute of Fuel

ANNUAL MEETING IN LONDON

The annual meeting of the Institute of Fuel was held last Thursday in the Meeting Hall of the Institution of Mechanical Engineers in London, when LT.-COL. J. H. M. GREENLY, C.B.E., was installed as President for the ensuing year and delivered a short address.

The PRESIDENT, in the course of his remarks dealing with "The Industrial and Social Aspect of Fuel," remarked that it might be said fuel had transformed the life of man in two ways: First, it enabled him more quickly and more effectively to perform work similar to that which he could, by more laborious methods, accomplish with his own hands. A rough calculation showed that a strong man could in one year do work which, converted into terms of heat, would not exceed 10 therms. The coal used in our industries in one year had a heat value of 35,000 million therms, or more than 3,000 for each individual employed. The second service which fuel provided was to enable man to perform operations which would otherwise be impossible for him. In every industry, thermal and electrical energy brought about changes in the properties of matter which had provided modern civilisation with an infinity of material resources unknown to our ancestors.

Although in many countries of the world much energy was derived from hydro-electric sources, and in the more uncivilised and primitive portions of the globe human and animal labour still predominated, we, here in these islands, continued to depend almost entirely upon carbonaceous fuels for heat and power. It was well to remember that in Great Britain we consumed more coal per head of the population than any other country in the world, the figures for 1937 being 3.9 tons per head. There were three fundamental processes: a gradual exhaustion of our coal resources at the rate of 230 million tons a year; a gradual increase of the demand for heat and power as new inventions and new phases of social requirements raised the standard of living; and, finally, the increased efficiency of utilisation due to the progress of fuel technology. These processes operated quite differently taken over a long period of time. During the past 25 years, the efficiency of utilisation had progressed rapidly, and it was probable that for a considerable number of years to come this would continue; but, sooner or later, the slowing-down of efficiencies must inevitably take place as the theoretical was approached. In some of the great power stations of the country we already recovered more than 90 per cent. of the heat in the coal in the steam leaving the boilers.

Continuing, the speaker said the influence of this increase in efficiency had made itself felt, particularly in the older centres of industrialism. Between 1909 and 1913, Great Britain and the United States jointly produced an average of 738 million tons of coal per annum. By 1936 this figure had fallen to 672 million tons; but as the total world production during the same period rose from 1,134 million to 1,280 million tons per annum, the proportion of the world's coal production in the hands of the two leading industrial countries fell from 65 per cent. in the pre-war period to 52 per cent. in 1936. Certain other countries, notably Germany, remained stationary during the same period, thus indicating that industrial expansion had kept pace with the reduction due to increasing efficiency. In contrast to this, one found that the group of newly-industrialised countries, such as the Soviet Union, Japan and China, rose from 10 per cent. of the world's pre-war total to 19.7 per cent. in 1936.

Regarding liquid fuel, the speaker said that, for all practical purposes, it was impossible to estimate the oil resources of the world; but there was little doubt that the most pessimistic view held a short time ago of imminent exhaustion was unfounded. It might, however, be taken as more than probable that the world's oil reserves could not indefinitely withstand the ever-increasing demands, and that a shortage would make itself felt within measurable time. There were, of course, various ways in which coal might be utilised to supply energy for road, marine and aerial transport in substitution for liquid fuel—by the actual conversion of coal into liquid fuel; by its direct application to internal-combustion engines; and by its conversion to some other form of energy, either steam or electrical, and it might well be that the rapid development of steam technique, coupled with the employment of lighter and at the same time heat-resisting metal might give to coal a new lease of life in the lighter transport fields.

Concluding, the speaker said that the two trends already mentioned towards greater demand for heat and power, and greater efficiency in utilisation of both, were vital to the continued prosperity of the country, and it would seem essential that there should be co-operation in accelerating both. To the coal industry, perhaps, the first trend was of more direct interest than the second. To the fuel-consuming industries, whether it be a liquid fuel or solid fuel, efficiency of utilisation was a continued preoccupation. Taking the long view, it should be realised that the progress in efficiency was likely to be a less permanent factor than the increase in demand for heat and power, and in the national interests it would appear desirable that systematic and organised co-operation between producers, distributors and consumers of fuel of all kinds, assisted by the scientist and the engineer, should be continually pressed forward in order to discover how our resources of coal and all its derivatives could be made the best use of so as to meet economically the ever-rising standard of living and the comfort and safety of the people as a whole.

Iron and Steel Output in September

The British Iron and Steel Federation report that there were 77 furnaces in blast at the end of September, compared with 81 furnaces at the end of August, seven furnaces having ceased operations during the month, and three having resumed production. The production of pig-iron in September was 429,800 tons, compared with 443,000 tons in August. The output included 98,100 tons of hematite, 244,000 tons of basic, 76,300 tons of foundry and 10,400 tons of forge pig-iron.

1938.	Pig iron.	Steel ingots and castings.
	Tons.	Tons.
January	761,100	1,081,400
February	693,300	1,057,600
March	714,600	1,115,800
April	661,000	938,600
May	633,900	957,000
June	541,500	776,100
July	507,800	683,200
August	443,000	658,900
September	429,800	754,700

The working month for pig-iron was a day short of August, and on this basis, pig-iron production has been fully maintained. The output of steel ingots and castings amounted to 754,700 tons, compared with 658,900 tons in August. The increased number of working days in September, compared with the previous month, would represent an 8 per cent. rise in the output of steel ingots and castings if an equal rate of operations were maintained. The September figure marks an advance of approximately 15 per cent. on August, indicating that activity in the industry as a whole has expanded. At the end of September there were 28 more open-hearth furnaces in operation, compared with a month earlier, and four more compared with the close of June.

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The Old Lancashire Steel Company

CHEQUERED CAREER OF ONE OF THE EARLIEST WORKS FORMED TO OPERATE THE BESSEMER PROCESS

The centenary year of Manchester's Charter provided an opportunity for the Manchester Literary and Philosophical Society recently, to consider an episode in the industrial history of the City, in the form of a Paper entitled "The Old Lancashire Steel Company" presented by MR. ERNEST F. LANG, M.I.Mech.E. It is really the story of one of the earliest Bessemer works outside Sheffield, founded entirely by Manchester men. While the matter is mainly of academic interest, the principal facts relating to this old concern may be worth recording.

The inception of the Lancashire Steel Company can be traced back to the time of the Great International Exhibition held in London in the year 1862. The engineering and metallurgical sections of that Exhibition included among their most interesting features the celebrated "Don Luiz" locomotive designed by Mr. Beyer for the South-Eastern Railway of Portugal, and the pavilion showing the products of the newly-established Sheffield firm of Henry Bessemer & Company. The exhibits of this concern included large steel shafts, steel hydraulic-press cylinders, railway axles, engine and carriage tyres, rough and finished gun-forgings, steel bars and rods, tool-steels, etc., all manufactured from steel made by the pneumatic process invented by Bessemer. Much excitement was caused by this display of the new steel, which attracted engineers from every part of Europe.

On no business community did this display produce a greater effect than that of Lancashire, and shortly after the opening of the Exhibition, Mr. John Platt, then M.P. for Oldham, approached Bessemer with an offer from himself and nine associates to purchase one-fourth share in the Bessemer patents over a period of ten years; £50,000 was the price agreed upon, a sum which greatly strengthened the position of Bessemer and his partners. This business arrangement was the forerunner, among others, of the negotiations which eventually led to the formation of the Lancashire Steel Company by a group of Manchester men headed by Mr. (later Sir) Edward Watkin, the railway magnate. Meanwhile the knowledge that Mr. John Ramsbottom had decided to install the process at Crewe greatly influenced and encouraged Mr. Watkin and his associates. The capital of the company as floated was £150,000 in 7,500 shares of £20 each, a modest total according to present-day finance, but in keeping with the circumstances of those times.

The main objects of the company were set forth in the prospectus in the following terms:—

"The promoters of this company having arranged with Messrs. Bessemer & Longsden to work their patents, on payment of certain royalties upon the steel produced, propose to erect suitable buildings, furnaces, blast engines, converting vessels, hydraulic cranes, steam hammers and rolling mills, capable of making a single block of steel of 10 tons weight, and of producing 200 tons of steel per week, adapted for rails, locomotive engine tyres, axles, crank shafts, marine engine shafts, piston rods, shafting, boiler and ship plates, cannons, mortars, girder-bridge plates, etc., and for all purposes where it is desirable to substitute Bessemer steel for iron."

"The company also contemplates erecting some of the largest and most powerful turning lathes, shaping, drilling, planing, and slotting machines, etc., for finishing the largest and heaviest marine engine shafts, cranks, locomotive-engine tyres, axles, etc., when the objects already named are developed."

The Bessemer installations at Gorton and Crewe both started operations about the same time in 1864 and were twin brothers, so to speak, in size and arrangement. The latter was destined for a long, untroubled and successful career as an adjunct to one of the largest railway works in the country, directed by the organising genius of Mr. Ramsbottom, favoured by immense facilities, and serving the Railway Company's own extensive requirements. The venture at Gorton, unsheltered from the hostility of long-established vested interests and prejudices, and encountering a far greater degree of conservatism and limitation of markets than had been expected, was destined for an altogether different career.

Whilst the pioneer operations at Gorton had to share the difficulties attending the development of the Bessemer process, the *rôle* of the Lancashire Steel Company was that of the first completely independent Bessemer steel company and dependent entirely upon its own resources in the direction of successful technical and commercial operations. In the latter respect, it was also in a different category from the already established iron-rolling mills, notably, at that time the great Dowlais Iron Works, where they were installing the Bessemer process with the intention of rolling 70,000 tons per annum.

The author at this point went on to outline the technical difficulties shared in common by all the early pioneers of the Bessemer process.

Initial Difficulties

The Lancashire Steel Company had an uneasy beginning. In 1864, before the end of their building operations, an attempt was made by the Ebbw Vale Company, backed by powerful financial interests, to get round the Bessemer patents. A chance revelation of their plans enabled Bessemer to meet the danger, but it required all his diplomatic skill and business acumen to do so. A further anxiety for the Lancashire Steel Company's shareholders, which lasted for several years of its existence, was a dispute between Bessemer and Mushet, which attained the dimensions of a public controversy and provided ammunition for the former's opponents. This arose out of Mushet's claim that the use of spiegeleisen as covered by his patents was indispensable for the Bessemer process. This claim was stoutly resisted, as also the validity of Mushet's patents on the ground of real novelty.

Early Attitude of War Office and Admiralty

The first serious rebuffs Bessemer had to encounter came from our own War Office and Admiralty, and reflected on the fortunes of the Lancashire Steel Company also. Considering that the genesis of his invention lay in the encouragement given him by the French Government, this was quite unexpected. Further, at the time that Bessemer first approached Woolwich he was able to convince the then Superintendent, Colonel Eardley Wilmot, of the value of his process. Shortly afterwards Sir William Armstrong, whose patented method of manufacturing ordnance by encircling a centre wrought-iron tube by coils of wrought iron was in use at Woolwich, became head of the Royal Gun Factory, and persuaded the then Minister of War that the use of steel was undesirable. Bessemer did all in his power to convince Sir William to the contrary, particularly during the Sheffield Meeting of the Institution of Mechanical Engineers in 1861, at which he presided, but Bessemer's specimens and tests of gun forgings there exhibited were completely ignored by him, as also the proofs offered that Bessemer ingots from Swedish steel costing £10 a ton could replace Lowmoor iron for the coiled gun at £20 a ton. The resignation of Sir William Armstrong in 1863 was considered a bull point for the Lancashire Steel Company, but the conservatism of our War Office continued for long afterwards.

At the time of the formation of the Lancashire Steel Company the firm of Henry Bessemer & Company had supplied no less than seventy forged steel guns for foreign service, but by the time the Gorton works had begun the manufacture of gun forgings, both companies had to meet the competition of Messrs. Krupp in the foreign market. The Essen firm had developed a system for casting ingots of the largest size from crucible steel which gave them almost a monopoly on the Continent in gun manufacture for many years; in fact, until the general use of the Siemens-Martin process in 1879.

Competition of Other Bessemer Plants

The author went on to record that time brought with it in one direction and another a fair amount of commercial success for the new company but not sufficient to enable its activities to be extended in the direction of the machine shops contemplated in its prospectus. The competition of the Bessemer plants installed as adjuncts to the older established rolling-mill firms such as Dowlais, Butterley and Ebbw Vale, aided by their better trading position, was being increasingly felt. Further, at a time when the resources of the Lancashire Steel Company were becoming severely strained, the violent attacks of the Press on the Bessemer patent discouraged the shareholders from finding further capital. They were also beginning to feel that the expectations formed from the contiguity of the Gorton Works to large engineering and railway plant establishments as indicated in their prospectus, and which had principally determined its site, were still far from realisation except in the single matter of rail deliveries.

As regards one reason for the site chosen by the Lancashire Steel Company, namely, its proximity to the Lancashire locomotive firms, the conservatism of railway engineers at home and abroad in favour of the wrought-iron boiler had virtually limited the operation of their plate mill to the production of general plates in which there was the most competition. What the Company had hoped to develop as a speciality, namely, the production of special quality boiler plates both for locomotive and stationary work, was only partly achieved and almost entirely in the latter category. In other directions, transport, cost of raw materials, a local market limited by the conservatism before alluded to, the competition of the Bessemer plants erected by the old-established rolling-mill firms, brought about a gradual exhaustion of the Company's resources.

Hard Facing

The coating of machine parts subjected to heavy wear with hard deposits of one kind or another has lately been extended to include the use of the hardest metallic substances known, the heavy metal carbides. The earlier efforts were restricted to the brazing of plates of sintered-carbide material on to the part requiring protection, but later spot welding was employed. Both of these processes suffered from severe limitations, for large plates of sintered carbide could not be dealt with and in addition the thermal stresses set up in the welding process frequently resulted in distortion and cracking. In a recent issue of "Maschinenbau/Der Betrieb," K. FENNEL writes on a process designed to produce articles of practically any shape with hard-wearing surfaces of sintered carbide on selected areas. The process is similar to duplex casting in that it is carried out in a single mould, but the carbide material is introduced in powder form and is not cast to shape. The process consists of making a heat-resisting mould of the shape of the finished article. The portions that have to be made hard are separated from the rest of the mould by metal gauze or perforated metal sheet and carbide powder is packed into the spaces. In complicated parts pre-sintered carbide inserts may replace the carbide powder. The remainder of the mould is now cast full of a suitable basis metal, be it iron, steel, copper or nickel. The molten metal penetrates the carbide powder and cements it in place, and the result is a single casting with the surface reinforced at selected places by a high concentration of hard-carbide material. The process has been used for briquette moulds, drawing mandrels and dies, and the production of milling cutters is envisaged in the patent.

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The Week's News in Brief

Trade Talk

THE FOURTH NATIONAL COAL CONVENTION will be held at the Wharncliffe Rooms, Hotel Great Central, London, on November 23 and 24 next.

THE MIDLAND MALLEABLE FOUNDRY COMPANY, LIMITED, is being wound up voluntarily. Mr. Albert Cripwell, 12, Cherry Street, Birmingham, is the liquidator.

BLACKSTONE & COMPANY, LIMITED, of Stamford, Lincs, which celebrated its centenary last year, is to publish a centenary record, written by Mr. Thomas L. Price.

THE WORKS AND BUSINESS of Vickers (Aviation), Limited, and the Supermarine Aviation Works (Vickers), Limited, are being taken over by Vickers-Armstrongs, Limited.

HARLAND & WOLFF, LIMITED, Belfast, have received a contract from the Union-Castle Mail Steamship Company, Limited, for the conversion of three liners from coal fuel to oil fuel.

HENRY ROBB, LIMITED, Leith, have received orders for two screw tugs for the Manchester Ship Canal Company, and another order from the British Tanker Company for five sea-going lighters of 400 tons.

THOMAS E. GRAY & COMPANY, LIMITED, of 119, High Holborn, London, W.C.1, have appointed Mr. W. S. Taylor, of 7, Alma Street, Falkirk, as their representative for the sale of refractories and plant.

THE COMMISSIONER FOR SPECIAL AREAS has now taken over the whole of Palmers Shipyard site at Jarrow, which has been in the hands of Thos. W. Ward, Limited, dismantlers, of Sheffield, for over three years.

MR. ROSS H. MACMASTER, President of the Steel Company of Canada, has announced that the company is considering the construction of a continuous-strip mill—the first projected for Canada—at a cost of $10,000,000.

ANOTHER STAGE in the completion of the "Queen Elizabeth" was reached at John Brown & Company's Clydebank shipyard last Thursday, when the first section of the main propelling machinery for the liner was shipped.

THE NORTH BRITISH LOCOMOTIVE COMPANY, LIMITED, Springburn, Glasgow, has re-opened part of the old Atlas Works at Springburn. New machinery has been installed, and staff and workmen from one of the firm's other establishments have been transferred to the Atlas Works.

OSCAR MOENICH & COMPANY, LIMITED, Billiter House, Billiter Street, London, E.C.3, have been appointed sole agents for Rudolf Bächer of Czechoslovakia. The latter firm manufactures agricultural machinery, presses, metal bending machines, circular and guillotine shears of every description.

THE GRAND COUNCIL of the Federation of British Industries, at a meeting held on October 12, considered fully the lessons which could be drawn from the recent crisis and the steps which industry should be called upon to take to assist the Government in meeting without delay their defence requirements. The Grand Council authorised the President to appoint a small committee to consider the action needed for the following purposes, and to consult with the Government thereon:—(1) To complete speedily the armament and defence requirements of the country; (2) to ensure that the confusion which existed in certain directions during the recent period of crisis should be avoided in any future emergency, and (3) to secure that industry can be effectively and speedily placed upon a war-time basis should this country, in spite of its will for peace, unfortunately be involved in a war.

ADDRESSING MEMBERS of the South Wales branch of the Institute of Metals at Swansea last week on the training of a metallurgist, Mr. Alyn I. Rees, secretary of the Advisory Council for Technical Education in South Wales and Monmouthshire, said one possibility, which had never been fully explored in South Wales, was the provision of junior technical schools for the metal trades. If education authorities were certain that the industry would absorb the output he was convinced they would be only too glad to consider the matter. The Advisory Council for Technical Education in South Wales and Monmouthshire had recently asked all local authorities to adopt a common scheme for part-time courses in metallurgy in the belief that if the same syllabuses were followed throughout the area a boy would be able to continue his course without break, even if he moved from one institution to another.

Personal

MR. JOHN W. WOOD has been appointed general manager of the Uskside Engineering Company, Limited, Newport, Mon.

MR. WALTER FINNIE, of Jarrow, who retired on September 30 from the position of North-East Coast manager of J. & E. Hall, Limited, Dartford, has had 37 years' service with the company.

SIR HAROLD CARPENTER, F.R.S., was presented with the honorary membership of the American Institute of Mining and Metallurgical Engineers at a luncheon given in his honour in London on Wednesday.

MR. J. N. HEWLETT BROOKE, who has been works manager for R. H. Neal & Company, Limited, engineers, since the firm transferred to Grantham, has been appointed to the firm's London sales office. He will be succeeded by Mr. C. W. J. Punell.

MR. J. J. GRACIE has been appointed commercial manager of the Witton Engineering Works of the General Electric Company, Limited, and Mr. N. F. T. Saunders, B.Sc., A.M.I.E.E., has been appointed general manager of Coldair, Limited, in succession to Mr. Gracie.

MR. VICTOR A. DIXON has been appointed joint managing director of Turton Bros. & Matthews, Limited, Sheffield, in consequence of the appointment of Sir Ronald Matthews, the managing director, as chairman of the London & North Eastern Railway Company.

THE FOLLOWING CHANGES have taken place in the staff of H. G. Sommerfield, Limited: Mr. A. C. Combe, C.A., has retired, and Mr. H. J. A. Johnson has been appointed secretary to the company in his place; Mr. L. B. Childe, B.Sc., A.M.I.Mech.E., A.C.G.I., has joined the board of directors, and is to be appointed chief engineer to the company; Mr. H. E. Ricketts also becomes a director and will assist in the foundry supplies and requisites side of the business, which is controlled by Mr. W. J. Hooker. Mr. C. J. Nurcombe continues as managing director.

MR. ISAAC EDWARD BAKER, assistant manager at the Devonshire Works blast furnaces of the Staveley Coal & Iron Company, Limited, has been appointed manager, and on September 30, his 50th birthday, succeeded his father, Mr. Isaac Baker, who has held the post for the past 35 years. Mr. Baker, Sen., a native of Chesterfield, started his career as a pig moulder at the Sheepbridge Works, and later was manager of the Park Gate Iron & Steel Company's Holmes furnace. He moved to Staveley on the erection of the first of the furnaces at Devonshire Works.

Obituary

THE DEATH has occurred of Mr. James G. Murdoch, who was a departmental manager in the sewing-machine works of the Singer Manufacturing Company, Limited, at Clydebank.

WE REGRET to announce the death of Sir Henry Fowler, at one time chief mechanical engineer of the London, Midland & Scottish Railway. He was best known to the general public as the designer of the "Royal Scot" locomotive, but to foundrymen for the great interest he invariably took in the conduct of the technical associations. He presided with distinction over the Institution of Mechanical Engineers, the Institution of Locomotive Engineers and the Institute of Metals. Sir Henry was, on several occasions, the principal guest at dinners organised by the Institute of British Foundrymen.

SIR WILLIAM JOHN JONES, who was Director of Refractory Materials during the war years, died at his home at Warlingham (Surrey) last week. He was 71 years of age. During the war he also became deputy controller of steel production and British representative on the Inter-Allied Steel Commission, in connection with the Ministry of Munitions. After the war he was in charge of a commission which examined the condition of the iron and steel works in Lorraine and the occupied areas of Germany. He was made a C.B.E. in 1918 and K.B.E. in 1919. Sir William Jones was an alderman of the Surrey County Council for 13 years. He was a director of Dorman, Long & Company, Limited, of Middlesbrough, and of the British Refractories Research Association, Limited.

Contracts Open

Dublin, October 25.—Manganese steel forgings and castings, for the Dublin Port and Docks Board. The Engineer's Office, East Wall, Dublin.

Melton Mowbray, November 4.—6¾ miles of 4 in. and 3 in. dia. spun and cast-iron pipes, etc., for the Melton and Belvoir Rural District Council. Pick, Everard, Keay & Gimson, consulting engineers, 6, Millstone Lane, Leicester. (Fee £2 2s., returnable.)

Melbourne, March 14.—Supply and erection of boiler-house plant, consisting of high-pressure water-tube boilers, pipework, coal- and ash-handling belt-conveyor-type plants, steel chimneys and steel boiler-house buildings, for the State Electricity Commission of Victoria. The Agent-General for Victoria, Melbourne Place, Strand, London, W.C.2. (Preliminary fee, £100.)

Milton.—Supply and fixing electrically-driven borehole type pump, for the Swadlincote and Ashby-de-la-Zouch Joint Water Committee. Pick, Everard, Keay & Gimson, consulting engineers, 6, Millstone Lane, Leicester. (Fee £2 2s., returnable.)

Peterborough, November 7.—Supply and erection of three sets of Diesel oil engines driving centrifugal pumps, each set being capable of lifting 60,000 galls. of water to a total head of approximately 140 ft., together with appurtenant works, for the Town Council. The City and Waterworks Engineer, Town Hall, Peterborough. (Fee £3 3s., returnable.)

Company Reports

Wellworthy Piston Rings, Limited.—Final dividend of 10 per cent., making 15 per cent. for the year ended July 31.

Birmingham Small Arms Company, Limited.—Dividend of 10 per cent. on the ordinary stock for the year ended July 31.

George Wilson (Gas Meters), Limited.—Dividend of 15 per cent. on the ordinary shares for the year ended June 30 last.

Stothert & Pitt, Limited.—Net profit for the year ended June 30, £66,231; brought in, £11,741; to income-tax reserve, £11,000; dividend on the ordinary shares of 12½ per cent; to reserve, £30,000; carried forward, £11,373. Meeting, October 24.

Applications for Trade Marks

The following list of applications to register trade marks has been taken from the "Trade Marks Journal":—

"B. & P." (DEVICE).—Brass stampings and castings. Bloore & Piller, 173 to 177, Hockley Street, Hockley, Birmingham, 19.

"SCOOTERCASE."—Steel, adapted for case-hardening processes. British Rolling Mills, Limited, Brymill Steelworks, Bloomfield Road, Tipton, Staffs.

"MOHICAN."—Steel. Atlas Steels, Limited, c/o H. D. Fitzpatrick & Company, 94, Hope Street, Glasgow, C.2.

"SIFSTEEL."—Rod steel for welding. Suffolk Iron Foundry (1920), Limited, Gipping Works, Stowmarket, Suffolk.

Forthcoming Events

OCTOBER 26.

Institute of Metals (London Section):—"Electron Diffraction and Surface Wear," Paper by Prof. G. I. Finch, at Royal School of Mines, London, S.W.7, at 8 p.m.

Institute of British Foundrymen

OCTOBER 29.

Newcastle-upon-Tyne Branch:—"Ironfounding in Hong Kong," Paper by S. Simpson, at Neville Hall, Newcastle-upon-Tyne, at 6.15 p.m.

The Institute of Vitreous Enamellers

OCTOBER 27.

Scottish Section:—Election of officers. "Moulding Sand Conditions in Relation to Cast Iron Enamelling," Paper by T. Tyrie, at Royal Technical College, Glasgow, at 7.30 p.m.

OCTOBER 28-30.

Fifth Annual Conference:—At the Hotel Normandie, Knightsbridge, London, S.W.1. Annual meeting at 4 p.m. and annual banquet at 7 p.m. on October 28. Technical sessions at 11 a.m. and 3 p.m., and theatre visit to Palladium at 9 p.m., on October 29. Motor-coach excursion, starting at 10.15 a.m. on October 30.

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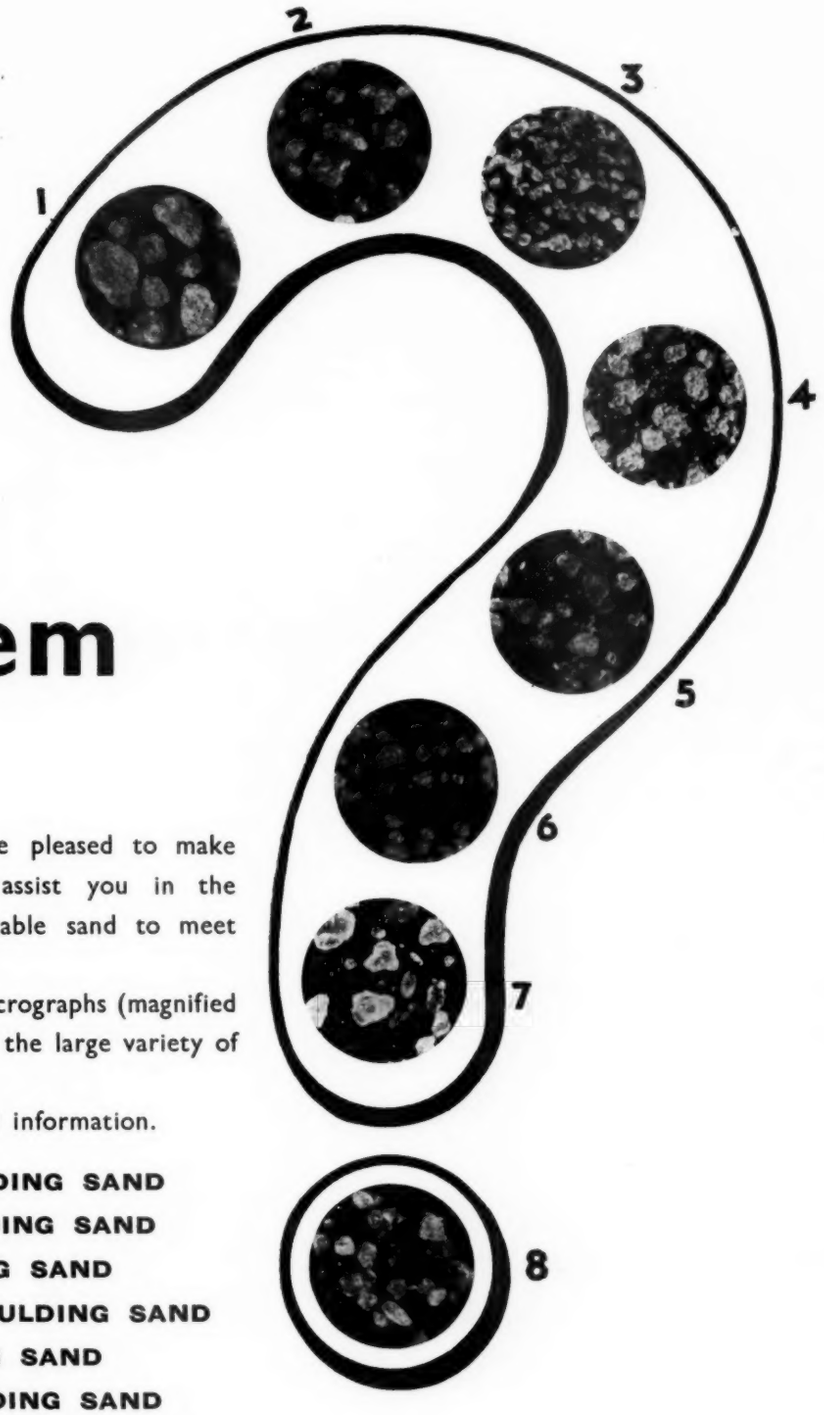

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7. CAVE BROWN MOULDING SAND
8. No. 60 MOULDING SAND

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Raw Material Markets

Although business in the pig-iron market is still at an unsatisfactory level, a better tone has recently developed and more inquiries are being made. A few orders are being placed, but generally for small parcels for prompt delivery. In many cases, consumers have used up almost all their stocks and are likely to re-enter the market on a good scale in the early part of next year.

Pig-Iron

MIDDLESBROUGH.—The Cleveland foundry iron trade now presents a better appearance than it has done for many months past. Consumers' stocks are no longer a drag on the market and several users are relying on current deliveries from the makers. As prices are expected to be lowered for deliveries after December 31, buyers are not negotiating farther ahead than that date, but recent business, in small tonnages, has amounted to quite a substantial total. Stocks at the producing end are also being reduced at a steady rate and it would seem that outputs will have to be raised if orders reach anticipated levels next year. Local foundries are busier as the result of armament orders and there is likely to be a continuance of these conditions. The current output of hematite is little more than is necessary to meet makers' own requirements. Other consumers have still large tonnages to take up under contracts, and, although there has been a better demand of late, it will be a considerable time before existing commitments are liquidated. A satisfactory feature has been the improvement in the export section, but the demand from overseas is still a long way below its former level.

LANCASHIRE.—Delivery specifications continue to increase and there has been a further welcome improvement in the number of orders placed. The most disappointing sections are still the textile-machinery and the light-castings trades. Deliveries to jobbing foundries are heavier, while machine-tool manufactures and heavy electrical engineering concerns are taking up satisfactory tonnages. For delivery in the Lancashire price zone up to the end of the year, Staffordshire and Derbyshire brands of No. 3 foundry iron are quoted on the basis of 114s., less 5s. rebate, with Northamptonshire No. 3 at 112s. 6d., and Derbyshire forge iron at from 111s. to 113s. The hematite market is still quiet and there has been little improvement. West Coast hematite is quoted at 141s. and East Coast material at 140s. 6d.

MIDLANDS.—There has been an increase in buying of foundry iron, but consumers are not going beyond the end of this year, as they are hoping for lower quotations then. The improvement is not reflected in all trades and orders from light-castings makers are still at a low ebb, with little likelihood of any real change for the better for some time to come. The demand for low-phosphorus iron is satisfactory and the heavy engineering concerns, particularly, are buying heavy supplies. Prices of this material also will in all probability decline at the end of the year and consumers are not booking too far ahead. No control is exercised on the low-phosphorus iron quotations and makers have already made concessions, so that a further reduction is by no means certain. In fact, if the demand continues to increase prices may advance. The hematite trade is still slow to revive. Heavy engineers are large users, but orders from this source have not expanded very much, suggesting that stocks are still quite heavy.

SCOTLAND.—Orders for early delivery only are being received and the turnover is not very heavy. No. 1 foundry iron is quoted at 120s. 6d. and No. 3 at 118s., f.o.t. furnaces. Short-time working is still general among light-castings makers and little change may be expected for some months, as the trade is now approaching its normal quiet season. Hematite mixed numbers are quoted at 133s., Scottish basic 107s. 6d., and English and Indian basic 100s., all less 5s. rebate, delivered steelworks.

Coke

There is a good call for deliveries of foundry coke and consumers are anxious to accumulate stocks in order to ensure that they will not be seriously inconvenienced by weather fluctuations later in the year. Export orders, also, are on a better scale. For delivery to Birmingham and Black Country stations, best Durham coke is quoted at 50s. 6d., and Welsh at from 50s. 6d. to 62s. 6d., according to quality.

Steel

Quiet conditions continue to rule in the steel market, but in one or two sections of the industry there are indications that some improvement in the demand may develop late in the year. The demand for most descriptions of semi-finished steel has broadened this month, but many consumers have still heavy stocks to absorb before their requirements can be considered normal. Imports of this class of steel have been limited for some months, and the demand for British material is gradually expanding. Conditions in the finished-steel section continue irregular. The reserve of orders in the hands of the heavy-steel works has fallen to a rather low level, and recently the demand has not been more than sufficient to prevent the reserve from declining. The absence of orders for new ships is severely felt in this branch of the industry. In the lighter sections of the trade there is a considerable amount of unemployed plant, but of late there have been signs of a more active demand. Export business, however, remains quiet, although there have been indications of a better inquiry.

Scrap

Although heavy stocks are still on hand, the outlook for iron and steel scrap merchants is more satisfactory. Many consumers are taking contract deliveries more freely, while new business is being done in some instances, although not in steel scrap, as prices for future deliveries have still to be announced.

Metals

There has been a continuance of firm conditions on the non-ferrous metal markets during the past week and further large transactions have taken place. There was a substantial slump in copper and tin prices on Tuesday, but increases were again noted on Wednesday.

Copper.—A revision of the copper producers' decision to increase the quota by 10 per cent. to 105 per cent. of the basic tonnages was made on Monday, when it was announced that producers subscribing to the regulation scheme had decided to remove all restriction as from October 15. The official *communiqué* states that this decision will operate "for whatever period is considered advisable." On the London Metal Exchange the news was well received, as it is appreciated that during the past few weeks stocks have been reduced considerably, and the outlook for the metal is much improved. The American Copper Institute reports that during the month of September world stocks of refined copper fell by 37,070 short tons, reducing the total to 457,454 tons. Blister copper stocks declined by 6,409 tons. World apparent consumption increased by 13,355 tons, as compared with the previous month, while world production of refined copper increased by 5,957 tons.

The firmness of the market has been well maintained in this country. In the United States, buying has increased, especially on armament account, while speculators have also shown a fair interest. American copper circles are reported not to be surprised at the removal of restrictions on copper production. While they feel that the move will result in increased production, and to that extent will not improve the world statistical position, it is considered that it will help European producers to meet European demands and should tend to prevent a runaway market, although whether the increased production will be offset by continued rearmament demands is another matter.

Metal Exchange quotations were as follow :—

Cash.—Thursday, £46 13s. 9d. to £46 15s.; Friday, £47 8s. 9d. to £47 10s.; Monday, £48 6s. 3d. to £48 7s. 6d.; Tuesday, £45 18s. 9d. to £46; Wednesday, £46 16s. 3d. to £46 18s. 9d.

Three Months.—Thursday, £46 18s. 9d. to £47; Friday, £47 13s. 9d. to £47 15s.; Monday, £48 11s. 3d. to £48 12s. 6d.; Tuesday, £46 3s. 9d. to £46 5s.; Wednesday, £47 1s. 3d. to £47 2s. 6d.

Tin.—Consumers' demands have been only moderate, but the tone of the market is firm. There has been a fair amount of speculative buying of late. American tinplate mills are operating at only one fifth of normal capacity, but there have been improvements in other industries, especially the motor-car trade. With regard to the outlook in the United States, C. S. Trench & Company, Inc., of New York, state that "the pronounced strength displayed in Wall Street was interpreted abroad not only as reflecting relief that war had been averted, but as denoting the expectation of a real revival in trade in the United States. As more than a year has elapsed since business started to slide off badly, and as such recovery as has occurred during the past three or four months has been only trifling, and the full effects of the administration's last lending and spending programme have not been felt yet, it would seem most probable that industry is due for a marked revival. But there will have to be real co-operation between the leaders of Government, labour, and industry, and not merely lip service, if healthy conditions are to be restored and maintained."

Official quotations were as follow :—

Cash.—Thursday, £207 5s. to £207 10s.; Friday, £209 to £209 5s.; Monday, £210 15s. to £211; Tuesday, £207 to £207 5s.; Wednesday, £210 15s. to £211.

Three Months.—Thursday, £208 5s. to £208 10s.; Friday, £210 5s. to £210 10s.; Monday, £211 15s. to £212; Tuesday, £208 to £208 5s.; Wednesday, £211 10s. to £212.

Spelter.—With the crisis now out of the way, there has been a reduction in the demand for this metal for A.R.P. and other defence work, although armaments are still accounting for a good proportion of current business. Nothing definite is known as to the progress, or otherwise, of the talks in connection with the rehabilitation of the International Zinc Cartel. A Brussels report states that the Belgian zinc producers have not been officially approached in regard to the establishment of a Cartel. The Belgian producers have reduced production considerably, whereas other Continental producers have not.

Daily market prices :—

Ordinary.—Thursday, £15 2s. 6d.; Friday £15 8s. 9d.; Monday, £15 13s. 9d.; Tuesday £15 8s. 9d.; Wednesday, £15 8s. 9d.

Lead.—There has been some active business in this metal during the past week and the tone of the market is strong. Continental and Japanese consumers continue to take up large tonnages.

Day-to-day quotations :—

Soft Foreign (Prompt).—Thursday, £16 11s. 3d.; Friday, £16 16s. 3d.; Monday, £16 16s. 3d.; Tuesday, £16 7s. 6d.; Wednesday, £16 8s. 9d.

Scrap.—No outstanding business has gone through during the past week and conditions have become rather quiet and dull. Price movements have been in an upward direction.

Approximate selling prices for old metal :—New aluminium cuttings, £67; rolled, £53; cast, £28; foil, £80. Copper, £40 to £45; braziery, £36. Brass (clean), £23 to £26. Zinc, £11. Lead, £15. Gunmetal, £41.

John Wilkinson Memorial Medal

The Annual Examination for the John Wilkinson Memorial Medal, open to members of the Junior Section of the Lancashire Branch of the Institute of British Foundrymen, will be held on Saturday, November 12. Details are available from Mr. J. E. Cooke, "Denstone," 7, Warren Drive, Swinton, near Manchester.

Aluminium in Building and Architecture

To meet a growing demand for information on the use of aluminium in all forms of building and architecture, a useful series of information sheets has been prepared by Mr. Oscar Bayne, A.R.I.B.A., in collaboration with the Northern Aluminium Company, Limited. Applications for these information sheets, which are supplied free of charge, should be made to the Northern Aluminium Company, Limited, Bush House, Aldwych, London, W.C.2. The scope of the sheets ranges from the application of aluminium in some of its commoner forms, such as casements and industrial window sections, to the use of extruded section as treads, nosing and hand-rails, etc., extruded angle and cover moulds, the use of more simple extruded sections and the working, joining and bending of wrought and cast alloys.